Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	WC Docket No. 17-108
Restoring Internet Freedom	)	

REPLY COMMENTS OF CHRISTOPHER S. YOO

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INTRODUCTION

I am the John H. Chestnut Professor of Law, Professor of Communication at the Annenberg School for Communication, Professor of Computer & Information Science at the School for Engineering and Applied Science, and Founding Director of the Center for Technology, Innovation, and Competition at the University of Pennsylvania. I have authored over nine articles and book chapters and three books on various aspects of communications law and policy.

I offer these reply comments in the proceeding on *Restoring Internet Freedom*. The views presented are my own and should not be attributed to my employer or to the Center for Technology, Innovation, and Competition. I have not received any compensation for these comments, nor have I been retained by any party with a financial interest in these proceedings.

I. CLASSIFYING BROADBAND INTERNET ACCESS SERVICE AS A TELECOMMUNICATIONS SERVICE DIRECTLY CONFLICTS WITH THE TEXT OF TITLE II

As paragraph 29 of the NPRM correctly notes, classifying broadband Internet access services as telecommunication services conflicts directly with the statutory text of Title II. Reclassifying broadband Internet services as information services would return to the approach upheld by the Supreme Court in *National Cable & Telecommunications Association v. Brand X Internet Services*.[1]

The statute defines "telecommunications service" as "the offering of telecommunications for a fee directly to the public."[2] "Telecommunications" is in turn defined as "the transmission, *between or among points specified by the user*, of information of the user's choosing, without change in the form or content of the information as sent and received."[3]

The plain meaning of the text requires that users of telecommunications service specify the origin and destination of the information they are transmitting by physical location. The

[1] 545 U.S. 967 (2005). The discussion in this section that follows draws on Christopher S. Yoo, *Is There a Role for Common Carriage in an Internet-Based World?*, 51 HOUS. L. REV. 545, 563-69 (2013).

[2] 47 U.S.C. § 153(53).

[3] *Id.* § 153(50) (emphasis added).

Supreme Court has long recognized that dictionary definitions represent an appropriate starting point for determining a statutory term's "primary and commonly accepted meaning."[4] A review of common dictionary definitions underscore that the plain meaning of "point" refers to a discrete physical location.[5]

As the FCC recognized in 2002 and the Supreme Court upheld in 2005, Internet users typically do not use IP addresses when browsing webpages, sending email, or performing typical uses of the Internet. Instead of inputting IP addresses, consumers usually use *domain names*, which are more natural language versions that are easier to remember. For example, the universal record locator (URL) for the University of Pennsylvania is www.upenn.edu. Determining which domain name corresponds to which IP address is done by a process known as the Domain Name System (DNS).

Consumers who use domain names to browse the web or send an email do not in fact identify the point to which they are sending and from which they are receiving their traffic. As the Supreme Court recognized as much in *National Cable & Telecommunications Association v. Brand X Internet Services*, when it observed, "a user cannot reach a third-party's Web site without DNS, which (among other things) matches the Web site address the end user types into his browser (or 'clicks' on with his mouse) with the IP address of the Web page's host server."[6] In so holding, the Supreme Court rejected contentions that the DNS was simply a database of routing information.[7] This led the Court to conclude that it was "*at least reasonable* to think of DNS" as providing sufficient additional functionality to remove Internet access providers outside the realm of telecommunications services and into the mutually exclusive realm of information services, with the italicized language suggesting that the Court might well think that this interpretation was textually compelled.[8]

A brief examination of the functions performed by DNS illustrates the point. As an initial matter, there is not a one-to-one correspondence between IP addresses and URLs that can be performed mechanically. Instead, the same domain name often consists of multiple IP addresses. To cite one example, the website for the University of Pennsylvania actually consists of two unique IP addresses: 128.91.34.233 and 128.91.34.234. Similarly, anyone who attempts to access www.google.com from another country recognizes, the mapping of domain names onto IP addresses is not simply mechanical. On the contrary, the DNS often routes the same domain name to different locations based on its inference of which location is most likely to be the one the end user wants. It is the DNS that determines which location will serve a particular request, not the end user.

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4 *Keppel v. Tiffin Savings Bank*, 197 U.S. 356, 362 (1905).

5 *See* THE AMERICAN HERITAGE COLLEGE DICTIONARY 1055 (3d ed. 1993) (defining "point" as "a. A place or locality considered with regard to its position. b. A narrowly particularized and localized position or place; a spot."); WEBSTER'S NINTH NEW COLLEGIATE DICTIONARY 908 (1991) (defining "point" as "(1) a narrowly localized place having a precisely indicated position . . . (2) a particularized place: locality"); WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 1749 (1986) (defining "point" as "a particularly narrowly limited part of a surface or of space that is singled out as occupying a usu[ally] precisely indicated spot and that has usu[ally] minimum extension or no relevant extension: a specific narrowly localized place having no relevant size or shape: a definitely precisely indicated placement or position of something"); 2 THE NEW SHORTER OXFORD ENGLISH DICTIONARY 2266–67 (rev. 3d ed. 1993) (defining "point" as "a thing having a definite position, without extension, a position in space, time, succession, degree, order, etc.").

6 545 U.S. 967, 999 (2005).

7 *Id.* at 999 n.3.

8 *Id.* at 999 (emphasis added).

Other firms rely on the DNS to provide differential benefits to consumers. DNS providers such as Open DNS, Nominum, and Google are using "smart" DNS services to compete on the speed with which they resolve DNS queries. Some will also look at a consumer's location and redirect a domain name request to a different location in an attempt to anticipate the location the consumer really wants, such as redirecting a query directed at a foreign website to a domestic version maintained by the same company. Some attempt to identify typographical errors in domain names entered into the address bar and suggest alternatives that may be the correct spelling (known as web error redirection) with varying degrees of success. Still others rely on DNS to provide parental controls to block access to adult websites and other unwanted content.

DNS is thus not simply a mechanical service for network management. It is a competitive business in which different providers offer different services in an attempt to appeal to consumers. In every case, it is the DNS that determines the destination of the transmission, not the consumer. The fact that end users may choose to change DNS providers does not change the analysis. Shifting from one DNS provider to another simply transfers who gets to decide the destination of Internet traffic from one third party to another. It does not put the end user in the position of determining the destination IP address. Unless the end user operates a private DNS service or invokes IP addresses by number instead of relying on URLs, it is the third-party DNS provider that specifies the endpoint of the transmission, not the end user.

DNS also performs a wide range of other services. For example, different DNS providers provide different levels of security. Some use patterns of DNS lookups to identify computers that may be infected with malware. Some identify malware known as botnets that force infected computers to follow the instructions of another computer known as a bot controller. They do so by looking at suspicious patterns of DNS lookups that can identify the existence of a controller. Other systems look for DNS lookups of young or esoteric domains as well as lookup failures.[9] Different DNS providers took different approaches to addressing a major security flaw known as the Kaminsky vulnerability. Some simply added a level of randomization by randomizing the port numbers. Others took more extensive measures, such as identifying flurries of DNS lookup errors or by deploying the DNS Security protocol (also known as DNSsec).

Moreover, DNS determines the location from which content delivery networks (CDNs) transmit information. CDNs, such as Akamai and Limelight, maintain thousands of servers across the Internet and rely on DNS to determine from which location it should serve any particular request. In short, DNS determines the point of transmission, not the user. In addition, DNS relies on caching to store

That is why the Supreme Court upheld the conclusion that when users who rely on DNS do not specify the point of transmission and thus are using an information service and not a telecommunications service. In addition, CDNs' reliance on caching represent the type of processing and storage associated with information services instead of the transparent, point-to-point transmission associated with telecommunications services. Proposals exist that would access information based on the name of the content instead of by location. One example is the Named Data Networking project being explored under the National Science Foundation's Future Internet Architecture program.[10] Another is the Digital Object Architecture currently being

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[9] Robert Lemos, *Got Malware? Three Signs Revealed in DNS Traffic*, DARK READING, May 23, 2013, *available at* http://www.darkreading.com/analytics/security-monitoring/got-malware-three-signs-revealed-in-dns-traffic/d/d-id/1139680.

[10] Lixia Zhang et al., *Named Data Networking*, 44 ACM SIGCOMM COMPUTER COMM. REV. 66 (2014).

embraced by the International Telecommunications Union as a way to displace ICANN as the essential actor in Internet routing[11] that has raised concerns.[12]

Although content-based routing is possible, even those advocating it recognize that adopting it would represent a fundamental deviation from the Internet we have today, which is built on the premise that each computer attached to the edge of the Internet have a unique Internet protocol (IP) address.[13] Broadband Internet access services could constitute a telecommunications service if users requested information by specifying an IP address. In fact, users typically request content based on URL. The Supreme Court recognized that when that is the case, it is the DNS that specifies the point of transmission, not the user, which makes broadband Internet access service an information service and not a telecommunications service.

II. CLASSIFYING BROADBAND INTERNET ACCESS SERVICE AS A TELECOMMUNICATIONS SERVICE EXCEEDS THE AUTHORITY OF SECTION 706

The 2010 Open Internet Order's attempt to base network neutrality principles on Section 706 is similarly flawed.[14] Section 706 provides:

> (a) The Commission and each State commission with regulatory jurisdiction over telecommunications services shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) by utilizing, in a manner consistent with the public interest, convenience, and necessity, price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment.
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> (b) The Commission shall, within 30 months after February 8, 1996, and annually thereafter, initiate a notice of inquiry concerning the availability of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) and shall complete the inquiry within 180 days after its initiation. In the inquiry, the Commission shall determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion. If the Commission's determination is negative, it shall take immediate action to accelerate deployment of such capability by removing barriers to infrastructure investment and by promoting competition in the telecommunications market.[15]

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[11] Digital Object Architecture (DOA) and the Master Framework Agreement Between ITU and the DONA Foundation (ITU-SG CL Information Document 13 Apr. 27, 2015), https://www.itu.int/md/S15-CL-INF-0013/en.

[12] *Michael O'Rielly: Foreign Governments Want Control Over the Internet*, UNION LEADER (May 24, 2017, 10:24 PM), http://www.unionleader.com/Another-View/Michael-ORielly-Foreign-governments-want-control-over-the-internet-05252017.

[13] *Id.* at 639. Cerf and Kahn recognized that providers may use a pool of IP addresses and dynamically assign them to individual hosts on a temporary basis. *Id.* at 645–46. The temporary nature of this assignment does not undercut the fact that at any particular moment, each address identifies a unique host.

[14] The discussion in this section that follows draws on Christopher S. Yoo, Wickard *for the Internet?: Network Neutrality After* Verizon v. FCC, 66 FED. COMM. L.J. 415, 426-31 (2014).

[15] 47 U.S.C. § 1302 (2006).

Subsection (a) explicitly authorizes the FCC to use four types of regulatory measures: (1) price cap regulation, (2) regulatory forbearance, (3) measures that promote competition in the local telecommunications market, and (4) other regulating methods that remove barriers to infrastructure. Subsection (b) provides that if the FCC finds that advanced telecommunications capability is not being deployed in a "reasonable and timely fashion," the FCC is authorized to employ two remedies: (1) removing barriers to infrastructure investment and (2) promoting competition in the telecommunications market. These are essentially identical to the fourth and third measures, respectively, authorized by subsection (a), making the analysis of the scope of the two subsections essentially parallel.

The 2010 Open Internet Order ruled that promoting the "virtuous circle" (or alternatively "virtuous cycle") represented one of the "other regulating methods" authorized by the statute. The Order reasoned that nondiscrimination and anti-blocking rules facilitate innovation by edge providers, thereby leading to increased demand for bandwidth by end users and spurring greater investment in infrastructure in turn.

Well-established principles of administrative law and statutory construction show this to be an impermissible interpretation of Section 706. The term "other regulating methods that remove barriers to infrastructure investment" is a classic catchall clause using general words to capture additional practices that fall outside the strict letter of the terms preceding it. The Supreme Court has held that "under the established interpretative canons of *noscitur a sociis* and *ejusdem generis*, where general words follow specific words in a statutory enumeration, the general words are construed to embrace only objects similar in nature to those objects enumerated by the preceding specific words."[16] Indeed, it is not even clear that these principles can be properly regarded as canons. The Supreme Court has noted that "[i]t is a familiar principle of statutory construction that words grouped in a list should be given related meaning" and that "[o]ne hardly need rely on such Latin phrases as *ejusdem generis* and *noscitur a sociis* to reach this obvious conclusion."[17]

The phrase "other regulating methods that remove barriers to infrastructure investment," is a classic catchall clause. Basic canons of statutory construction require that its scope be limited to the terms that precede it.[18] All of the items in the list preceding this catchall—"price cap regulation," "regulatory forbearance," and "measures that promote competition in the local telecommunications market"— are deregulatory in focus. This renders problematic the court's interpretation of the catchall to justify imposing more restrictive regulation.

Despite the *Verizon* court's emphasis on "regulatory methods," a brief passage later in the opinion suggests that the court may have relied on the provision of section 706 authorizing the FCC to adopt "measures that promote competition in the local telecommunications market."[19] This does not change the analysis, however. As the Supreme Court has explained, terms in an enumerated list are construed using "[t]he familiar canon of *noscitur a sociis*, the interpretive rule that words and people are known by their companions."[20] Thus, just as *ejusdem generis*

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16 *Wash. State Dep't. of Soc. & Health Servs. v. Guardianship Estate of Keffeler*, 537 U.S. 371, 384 (2003) (internal quotation marks and alterations omitted).

17 *Third Nat'l Bank in Nashville v. Impac Ltd.*, 432 U.S. 312, 322 & n.16 (1977) (internal quotation marks omitted).

18 *See, e.g.*, *Harrison v. PPG Indus., Inc*., 446 U.S. 578, 601 (1980) ("The rule of ejusdem generis ordinarily 'limits general terms which follow specific ones to matters similar to those specified.'" (citing *Gooch v. United States*, 297 U.S. 124, 128 (1936)).

19 *Id.* at 642–43.

20 *Maracich v. Spears*, 133 S. Ct. 2191, 2201 (2013).

counsels in favor of construing a catchall term in light of the other terms in a list, *noscitur a sociis* leads to the same conclusion with respect to enumerated terms. The same logic would militate in favor of construing this term as being limited to deregulatory measures.

The legislative history of section 706 also casts doubt on any expansive interpretations of Section 706. According to the conference report accompanying the Telecommunications Act of 1996, section 706 originated in a provision in the Senate bill that had no counterpart in the House version.[21] The Senate provision was part of a title of the bill entitled "An End to Regulation" and was preceded by provisions entitled "Transition to competitive pricing," "Biennial review of regulations; elimination of unnecessary regulations and functions," and "Regulatory forbearance."[22] The overall sweep of these provisions and the provisions' titles was to lessen regulation, not increase it.

Moreover, during the preceding Congress, the Senate Commerce Committee reported a bill in 1994 containing a provision that appears to be the antecedent to section 706.[23] This provision, the final provision of the bill, stated:

> (a) PROMOTION OF ADVANCED TELECOMMUNICATIONS NETWORK CAPABILITY – The Commission shall promote to all Americans, regardless of location or disability, the deployment of switched, broadband, telecommunications networks capable of enabling users to originate and receive affordable and accessible high quality voice, data, graphics, and video telecommunications services. In promoting the deployment of such networks, the Commission shall, to the maximum extent feasible, rely on competition among telecommunications providers. In the event the Commission determines that users are not gaining reasonable and timely access to switched, broadband, telecommunications network capabilities, the Commission shall have the authority to provide sufficient incentives such that this access is achieved.
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> (b) RULEMAKING.-If the Commission finds in its inquiry proceedings or any other time that switched, broadband, telecommunications network capabilities are not being deployed to all Americans in a reasonable and timely fashion, it shall commence a rulemaking to prescribe regulations using incentives to promote, to the maximum extent technically feasible and economically reasonable, the availability of switched, broadband, telecommunications network capabilities.[24]

This language clearly identifies "competition among telecommunications providers" as the preferred method for promoting broadband deployment. Indeed, as the Senate Commerce Committee's report that accompanied the bill emphasized:

> The Committee anticipates that this goal will be achieved through competition that is enhanced under the terms of this bill. But if this goal is not being achieved

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21 S. REP. NO. 104-230, at 210 (1996) (Conf. Rep.).

22 Telecommunications Competition and Deregulation Act of 1995, S. 652, 104th Cong. (1995), *reprinted in* 141 CONG. REC. 16346, 27846 (1995).

23 Communications Act of 1994, S. 1822, 103d Cong. (1994).

24 *Id.*

> in a timely fashion, the FCC is authorized to act under this section to expedite deployment through the use of incentive regulation.[25]

The legislative history thus evinces a clear emphasis on deregulation and competition among broadband access providers as the preferred way to promote broadband deployment. Moreover, the legislative history contains no hints that Congress regarded promoting innovation in content and applications as an appropriate course of action.

Reading the catchall provision of Section 706 as an affirmative grant of authority to impose net neutrality requirements on broadband Internet access providers would be potentially expansive. Under this approach, the FCC would not only have the authority to institute measures that promote infrastructure investment directly, but also to regulate anything that indirectly affects infrastructure investment as well. In this sense, the court's reasoning is similar to the reasoning followed in a case well known to every first-year law student: *Wickard v. Filburn*.[26] The explicit terms of the Commerce Clause of the Constitution give Congress the power to regulate only commerce "with foreign Nations, and among the several States, and with the Indian Tribes."[27] Before *Wickard*, the Supreme Court forbade the federal government from asserting jurisdiction over commerce that was purely intrastate.[28] In *Wickard*, however, the Court abandoned this vision of dual sovereignty and extended federal jurisdiction to purely intrastate activities that had a tangential impact on interstate commerce.[29] Because almost everything has a putative tangential impact on commerce, *Wickard* opened the door to an expansion of the commerce power such that left few activities outside its scope.[30] Expanding the FCC's jurisdiction beyond activities that have a *direct* impact on infrastructure investment to encompass those that have a *tangential* impact on infrastructure investment would leave few activities outside the FCC's power.

III. SUBJECTING THE INTERNET TO COMMON CARRIAGE REQUIREMENTS REPRESENTS BAD PUBLIC POLICY

Even if the legal barriers can be overcome, as a matter of policy, proposals advocating the extension of common carriage regulation to Internet-based services must engage the substantial body of scholarship analyzing the regime's shortcomings.[31] Doing so would raise problems in enforcing nondiscrimination, determining reasonable rates, and facilitating collusion.

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[25] S. REP. NO. 103-367, at 103 (1994). Here, "incentive regulation" refers to price cap regulation. *See* Howard A. Shelanski, *Adjusting Regulation to Competition: Toward A New Model for U.S. Telecommunications Policy*, 24 YALE J. ON REG. 55, 59 (2007).

[26] 317 U.S. 111 (1942).

[27] U.S. CONST. art. I, § 8, cl. 3.

[28] *See, e.g.*, *Hammer v. Dagenhart*, 247 U.S. 251 (1918).

[29] *Wickard*, 317 U.S. at 124.

[30] *See, e.g.*, *Gonzales v. Raich*, 545 U.S. 1 (2005); *Hodel v. Va. Surface Mining & Reclamation Ass'n*, 452 U.S. 264 (1981); *Perez v. United States*, 402 U.S. 146 (1971); *Katzenbach v. McClung*, 379 U.S. 294 (1964); *Heart of Atlanta Motel v. United States*, 379 U.S. 241 (1964). For the exceptions, which are notable primarily for their rarity, see *United States v. Morrison*, 529 U.S. 598 (2000); and *United States v. Lopez*, 514 U.S. 549 (1995).

[31] The discussion in this section draws on Yoo, *supra* note 13, at 573-605

A. Enforcing Nondiscrimination

The textbook definition of discrimination is a price differential for the same product that is not justified by differences in product quality or cost.[32] Identifying discrimination thus requires far more than simply seeing whether firms are charging customers the same price. Regulators must examine whether any of the price differences may be justified by variations in product attributes or in the cost of serving those customers. Interestingly, regulators must make these evaluations even when the prices charged are the same.[33] Charging two customers the same price can be discriminatory if providing the product or service to those customers differs in terms of quality or cost.[34]

In addition, economists and policymakers have long recognized the potential virtues of demand-side price discrimination that is related not to differences in product quality or cost, but rather based on the intensity of different customers' preferences for the product. The insights and challenges posed by this type of discrimination are reflected in the longstanding debate over Ramsey pricing.[35]

1. Differences in Quality. As noted above, any nondiscrimination mandate must evaluate whether any price differences are justified by variations in product quality. As a result, common carriage regimes work best for commodities for which product quality does not vary. Classic examples include water, natural gas, and electric power.[36]

For Internet-based services, the sources of variations in quality are vast. As an initial matter, quality of service on broadband networks varies along as many as four dimensions: bandwidth, delay, jitter, and reliability.[37] Whereas voice communications on the telephone network operated only within a narrow range of service parameters, the services that network providers offer and that applications demand can vary widely. Indeed, the benefits from allowing more diverse offerings were one of the reasons for declining to subject enhanced services to common carriage regulation.[38]

Moreover, the inherent limits on propagation speeds means that users communicating with distant locations will necessarily receive less bandwidth.[39] The feedback-based congestion

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[32] *See, e.g.*, F.M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 489 (3d ed. 1990); JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 133–34 (1988).

[33] *See* HERBERT HOVENKAMP, FEDERAL ANTITRUST POLICY: THE LAW OF COMPETITION AND ITS PRACTICE § 14.6, at 581 (3d ed. 1994); SCHERER & ROSS, *supra* note 32, at 489, 510, 513–14.

[34] *See* HOVENKAMP, *supra* note 33, § 14.6, at 581; SCHERER & ROSS, *supra* note 32, at 489, 510, 513–14.

[35] *See* Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847, 1901–04 (2006).

[36] *See* JEFFREY CHURCH & ROGER WARE, INDUSTRIAL ORGANIZATION: A STRATEGIC APPROACH § 26.2.3, at 853–54 (2000); Eli M. Noam, *Towards an Integrated Communications Market: Overcoming the Local Monopoly of Cable Television*, 34 FED. COMM. L.J. 209, 219 (1982).

[37] ANDREW S. TANENBAUM, COMPUTER NETWORKS § 5.4.1, at 397 (4th ed. 2003).

[38] Amendment of Section 64.702 of the Commission's Rules and Regulations (Second Computer Inquiry), Final Decision, 77 F.C.C.2d 384, 428–30 ¶¶ 115–118 (1980). Interestingly, the nondiscrimination mandate embodied in the Open Internet Order is more restrictive than the nondiscrimination mandate reflected in traditional common carriage. Under common carriage, providers can charge different prices for different classes of service so long as they make that service available to all similarly situated customers. Although the Open Internet Order permits providers to offer different classes of service to *end users*, it forbids offering different classes of service to *content and application providers* even if they make each class of service available to everyone. Daniel A. Lyons, *Net Neutrality and Nondiscrimination Norms in Telecommunications*, 54 ARIZ. L. REV. 1029, 1058 (2012);.

[39] CHRISTOPHER S. YOO, THE DYNAMIC INTERNET: HOW TECHNOLOGY, USERS, AND BUSINESSES ARE TRANSFORMING THE NETWORK 46-48 (2012); *see* Erik Brynjolfsson, Paul Hofmann & John Jordan, *Cloud*

control mechanisms embedded in the Transmission Control Protocol (TCP) exacerbate this problem by allowing transmission sessions with shorter feedback loops to increase their sending rates more rapidly than sessions with longer feedback loops.[40] Further difficulties arise from the fact that quality of service is also the product of how other subscribers are using the network. If everyone generates traffic at the same time, everyone receives lower quality of service in ways that could justify cost differentials but are difficult to observe.[41]

This is why many observers regard Internet-based services as particularly ill-suited to common carriage regulation.[42] For example, cloud computing is based on networking services that are highly differentiated and nonfungible in terms of service level and functionality, with the needs of different customers varying widely.[43]

2. Differences in Cost. Moreover, when production technologies vary, regulators imposing nondiscrimination mandates must carefully scrutinize production technologies and costs. Indeed, the failure to take such cost differentials into account has been a major source of criticism of the way price discrimination is addressed under the antitrust laws.[44]

Such cost differentials are likely to be quite prevalent in Internet access services. As an initial matter, Internet access is provided by a wide range of production technologies, including cable modem service, fiber-based service, DSL service, and wireless broadband. Each of these services varies widely both in terms of cost and in terms of product quality.

Even more importantly for our purposes, even within the same production technology, the cost of providing service can vary widely customer to customer. In network industries, the primary expense is in the fixed cost needed to establish the principal line providing service to a neighborhood, which is large compared to the cost of connecting individual subscribers to that line.[45] When that is the case, the principal determinant of unit cost is the density of subscribers in any particular area, as increases in density permits fixed costs to be amortized over a larger number of subscribers.[46]

One would thus expect subscribers in more densely populated areas to pay less than those in areas in which subscribership is sparser. Most regulatory authorities mandate rate averaging to ensure that all customers pay the same amount regardless of location. For example, public utility commissions have generally set rates for local telephone service that are uniform across the entire state even though the real costs of providing service vary.[47] In this way, somewhat

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Computing and Electricity: Beyond the Utility Model, COMM. ACM, May 2010, at 32, 34. The natural limits imposed by the speed of light are exacerbated in wireless networks, where natural attenuation and the addition of noise requires data destined for more distant locations to be encoded using modulations that necessarily provide less bandwidth. YOO, *supra* note 39, at 46–48.

[40] Christopher S. Yoo, *Herbert Wechsler in Cyberspace: Applying the Critique of Neutral Principles to Internet Policy* (forthcoming 2014).

[41] Christopher S. Yoo, *Network Neutrality, Consumers, and Innovation*, 2008 U. CHI. LEGAL F. 179, 206.

[42] Yoo, *supra* note 35, at 1852–53.

[43] *See* Ergin Bayrak, John P. Conley & Simon Wilkie, *The Economics of Cloud Computing*, 27 KOREAN ECON. REV. 203, 211–12 (2011); Brynjolfsson, Hofmann & Jordan, *supra* note 39, at 34; Kenji E. Kushida, Jonathan Murray & John Zysman, *Diffusing the Cloud: Cloud Computing and Implications for Public Policy*, 11 J. INDUS. COMPETITION & TRADE 209, 212 (2011).

[44] *See, e.g.*, CHURCH & WARE, *supra* note 36, § 5.5, at 177; W. KIP VISCUSI, JOSEPH E. HARRINGTON, JR. & JOHN M. VERNON, ECONOMICS OF REGULATION AND ANTITRUST 343-44 (4th ed. 2005).

[45] *See* Shelanski, *supra* note 25, at 60, 89–90.

[46] *See id.* at 60, 85, 89–90; *see also* Timothy F. Bresnahan & Peter C. Reiss, *Entry and Competition in Concentrated Markets*, 99 J. POL. ECON. 977, 980–83 (1991).

[47] *See* Shelanski, *supra* note 25, at 60.

ironically, the traditional implementation of common carriage violates fundamental principles of nondiscrimination. Stated somewhat differently, by implicitly requiring urban subscribers to cross-subsidize the connectivity of rural subscribers, uniform rate structure violates the fundamental principle of nondiscrimination that the actual rates charged be subsidy free.[48] Indeed, the Supreme Court recognized that imposing such cross subsidies in the name of promoting universal service represented "state-sanctioned discrimination."[49]

Implementing nondiscriminatory pricing is also greatly complicated by the manner in which the cost of providing service varies over different parts of the day and different locations.[50] The primary source of costs in the Internet is congestion, which arises when multiple subscribers use the network at the same time.[51] Congestion, moreover, only becomes problematic when network components become fully saturated, making the actual costs of providing service highly dependent on actual levels of usage.[52] More specifically, they are likely to vary widely from moment to moment.[53] In addition, technologies such as cable-modem service and wireless broadband aggregate traffic locally, making subscribers highly susceptible to the usage levels of their immediate neighbors.[54] This means that congestion can also vary geographically, with one node being saturated, while the adjacent node is not.

Any true pricing scheme that was truly nondiscriminatory would thus vary from minute to minute as well as from place to place. Such a regime would face significant implementation problems. As an initial matter, the localized nature of the Internet means that each network provider is only aware of local conditions. It has no systematic way of discerning congestion levels of its downstream partners when it hands off traffic.[55] Although those channel partners could share that information, network providers jealously guard information about the configuration of their networks and the loads being carried by them.[56] In addition, network providers would have to provide extensive new systems to monitor and propagate information about network usage and pricing at a timescale relevant to actual costs.[57] Moreover, although permitting traffic levels to grow without any change in price so long as the network is slack would reflect actual costs, such an approach would cause network resources to become locked out as soon as they became saturated. Such sharp discontinuities in network behavior can cascade into synchronization that can lead to wide-scale disruptions and inefficient usage of network resources.[58] Finally, subscribers' ability to adjust to dynamic pricing is rather limited.

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48 *See, e.g.*, CHURCH & WARE, *supra* note 36, § 26.2.1, at 846; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 445–47.

49 *Verizon Commc'ns Inc. v. FCC*, 535 U.S. 467, 480 (2002).

50 Yoo, *supra* note 41, at 189–90, 194–95, 201–02, 206–11.

51 *Id.* at 189, 207–11.

52 Daniel F. Spulber & Christopher S. Yoo, *On the Regulation of Networks as Complex Systems: A Graph Theory Approach*, 99 NW. U. L. REV. 1687, 1709–13 (2005).

53 Yoo, *supra* note 41, at 210–11.

54 *Id.* at 201–02, 208–11.

55 *Id.* at 210–11.

56 *See* VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 168; YOO, *supra* note 39, at 43, 78–81; Yoo, *supra* note 41, at 233–34.

57 *See* Yoo, *supra* note 35, at 1884–85; Yoo, *supra* note 41, at 208–10.

58 *See* Sally Floyd & Van Jacobson, *Random Early Detection Gateways for Congestion Avoidance*, 1 IEEE/ACM TRANSACTIONS ON NETWORKING 397, 397–402, 405 (1993) (discussing how the RED algorithm avoids synchronization to maintain an average queue size); Bob Braden et al., *Recommendations on Queue Management and Congestion Avoidance in the Internet* 3–4 (Internet Eng'g Task Force Network Working Grp., Request for Comments No. 2309, 1998), *available at* http://tools.ietf.org/pdf/rfc2309.pdf.

Indeed, research indicates that they cannot process pricing plans that involve more than three dayparts.[59]

All of these considerations are likely to make nondiscrimination mandates difficult to implement. They are also likely to cause real-world prices to deviate from true nondiscriminatory prices.

3. Demand-Side Price Discrimination. Like all products characterized by high fixed costs and lower marginal costs, services provided by network industries confront a fundamental pricing problem. Academic scholarship on networks and regulators has long recognized how price discriminatory regimes such as Ramsey pricing can alleviate these problems.

The pricing problem is best understood in terms of the impact of high fixed cost on the relative position of the marginal cost and average cost curves.[60] Usually fixed costs place consistent downward pressure on marginal cost as those upfront investments are amortized over increasingly large volumes. The impact of fixed costs on average costs decays exponentially to the point where further increases in production only cause small marginal reductions on average cost.[61] At small volumes of production, the ability to realize scale economies causes variable cost initially to reinforce this downward pressure on marginal cost and average cost.[62] Sources of scale economies are typically exhaustible, however.[63] Moreover, as production volumes increase, the cheapest sources of raw materials will become exhausted, and producing firms will have to manage an increasing number of resources.[64] At some point, the economies of scale become replaced by diseconomies of scale, at which point variable costs begin to place upward pressure on average cost.[65] Eventually the upward pressure on average cost associated with variable cost dominates the increasingly weak downward pressure associated with fixed cost, the marginal cost curve will cross the average cost curve, and the average cost curve will begin to rise (indicated in Figure 1 by Q^*).[66] The larger the fixed costs, the higher the quantity at which this crossover point will occur.[67]

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59 Yoo, *supra* note 41, at 209.

60 Yoo, *supra* note 35, at 1901–02.

61 *Id.*

62 VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 85–87.

63 Yoo, *supra* note 35, at 1901.

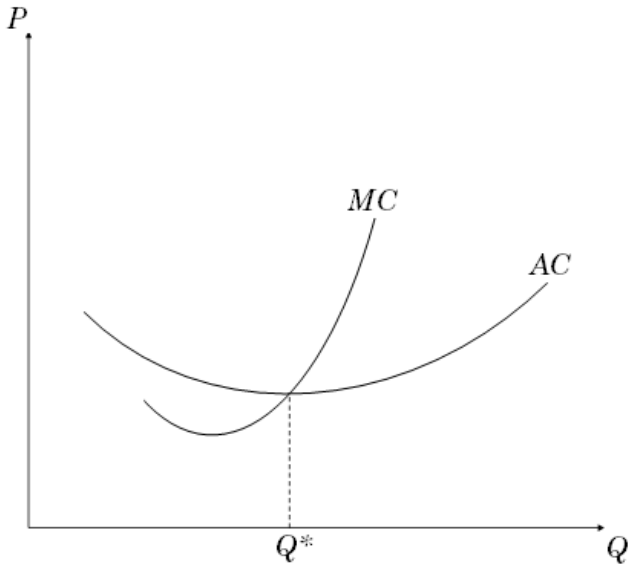
64 CHURCH & WARE, *supra* note 36, § 3.2, at 63–67, § 4.1.2, at 120–21, § 14.1.1, at 500–01; SCHERER & ROSS, *supra* note 32, at 103.

65 SCHERER & ROSS, *supra* note 32, at 104.

66 *See id.* at 102–06.

67 *See id.* at 98–100.

Figure 1: The Impact of Fixed Cost on the Relationship Between Marginal and Average Cost



The maximization of economic welfare must satisfy two conditions. First, price must equal marginal cost, otherwise further increases in production would cause economic welfare to decrease.[68] Second, price must equal or exceed average cost, otherwise the producing firms will go out of business, and the short-run equilibrium will not be stable in the long run.[69] It is easy to identify prices that both equal marginal cost and equal or exceed average cost if industry demand is sufficiently large to permit multiple firms to produce volumes that exceed Q^*. If, on the other hand, the total industry volume is less than Q^*, no price-quantity pairs exist that both equal marginal cost and equal or exceed average cost. Any prices that equal average cost and thus permit the firm to break even necessarily exceed marginal cost and create some degree of deadweight loss.

Monopolists seeking to maximize their profits will produce where marginal revenue equals marginal cost(represented in Figure 2 by P_{mon} and Q_{mon}). At this point, prices are inefficiently high, in that they exceed marginal cost. The traditional policy response is to regulate rates regulation to drive down the prices charged by the monopolist. To be sustainable, however, the price must permit the monopolist to cover its production costs, which requires that the prices equal or exceed average cost. Absent price discrimination, the lowest sustainable price that equals or exceeds average cost is represented in Figure 2 by P_{sus}. The fact that P_{sus} exceeds marginal cost means that it is inefficient and leads to a shortfall in production equal the difference between Q_{sus} and Q_{eff}. The monopolist could serve consumers between Q_{sus} and Q_{eff} by charging them prices that fall below average cost and compensating by charging other customers prices that exceed average cost. In short, the only way both to maximize economic efficiency and to allow the monopolist to cover its costs so that it can remain in the market.[70]

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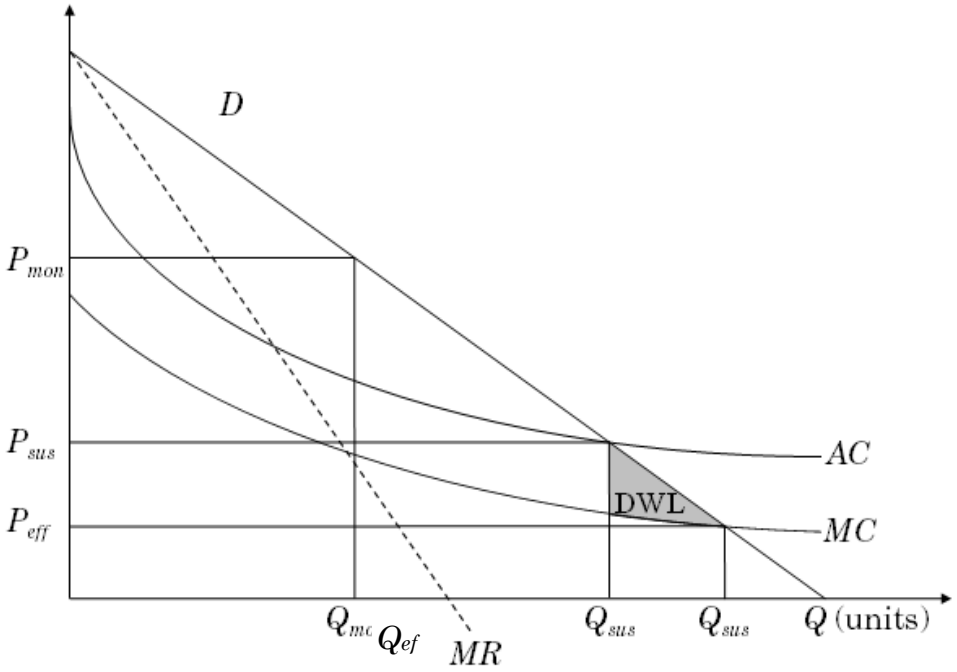
[68] *See* Yoo, *supra* note 35, at 1901. Indeed, the late Alfred Kahn called marginal cost pricing "[t]he central policy prescription of microeconomics." 1 ALFRED E. KAHN, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 65 (1970).

[69] Yoo, *supra* note 35, at 1901.

[70] *Id.* at 1901–02.

Figure 2: The Inevitability of Deadweight Loss in the Presence of Nondiscriminatory Pricing and High Fixed Cost[71]



It is for this reason that economic textbooks regard price discrimination as a necessary condition to maximizing economic welfare in industries, like telecommunications, that require substantial fixed-cost investments.[72] Indeed, this is the insight underlying Ramsey pricing, which allocates a higher proportion of the fixed costs to those consumers are the least price sensitive (and thus will reduce their purchases only minimally even though prices exceed marginal cost) and a lower proportion of the fixed costs to those consumers who are the most price sensitive (and who will decrease their consumption sharply in response to any increase in price).[73]

The FCC has been reluctant to permit Ramsey pricing in the context of unbundling out of concern that it would raise prices on those elements that are the most difficult to replicate, which it believed was inconsistent with the statute's focus on promoting competition.[74] One study estimated the welfare loss stemming from the refusal to implement Ramsey pricing for local telephone service at approximately $30 billion per year.[75]

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[71] This Figure was adapted from Yoo, *supra* note 35, at 1902 fig.2.

[72] *See, e.g.*, CHURCH & WARE, *supra* note 36, § 25.2.1, at 795; JEAN-JACQUES LAFFONT & JEAN TIROLE, COMPETITION IN TELECOMMUNICATIONS § 2.2.1.1, at 61–65 (2000); SCHERER & ROSS, *supra* note 32, at 496–99; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 417–18.

[73] Yoo, *supra* note 35, at 1902.

[74] Implementation of the Local Competition Provisions in the Telecommunications Act of 1996; Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers, First Report and Order, 11 FCC Rcd. 15499, 15853 ¶ 696 (1996), *aff'd sub nom. Verizon Commc'ns Inc. v. FCC*, 535 U.S. 467, 515–16 (2002).

[75] Robert W. Crandall, *Is It Time to Eliminate Telephone Regulation?*, *in* TELECOMMUNICATIONS POLICY: HAVE REGULATORS DIALED THE WRONG NUMBER 17, 23 (Donald L. Alexander ed., 1997).

B. Determining When Rates Are Just and Reasonable

Another aspect of common carriage is rate regulation, as demonstrated by the requirement that rates be just and reasonable. The Mann-Elkins Act of 1910 assigned responsibility for assessing rates to the Interstate Commerce Commission, which was focused primarily on the railroads and paid little attention to telephony.[76] The Communications Act of 1934 transferred the authority to review rates to the newly created FCC, which promptly launched an investigation into AT&T's rates.[77] The FCC used studies by members of the Special Investigation staff regarding the Long Lines Department's operations to obtain a $12 million reduction in long distance rates, announced on December 2, 1936.[78] The process used to set these rate reductions was surprisingly informal, consisting of informal negotiations with AT&T, which the FCC, in a self-congratulatory manner, lauded as avoiding the necessity of protracted rate proceedings and litigation.[79] Indeed, this would represent the only formal investigation of AT&T's rates for nearly three decades, as the FCC adopted a policy of "continuing surveillance," during which rate adjustments were negotiated through informal discussions.[80] Perhaps most shocking was the fact that these proceedings were immune from judicial review, as courts did not regard the public notices announcing the products of these negotiations to be agency action.[81]

This cozy world of collusive cooperation began to unravel when the federal government began to suspect that it was being overcharged.[82] This led the FCC to launch its first cost study in nearly thirty years, which showed a wide disparity in the returns AT&T was earning on seven different classes of service.[83] This led to a formal investigation of AT&T's rates.[84] More importantly for our purposes, it induced the FCC to adopt formal rate proceedings for the first time,[85] albeit with some hesitation, which drew the ire of one of the sitting FCC Commissioners.[86]

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[76] DANIEL F. SPULBER & CHRISTOPHER S. YOO, NETWORKS IN TELECOMMUNICATIONS: ECONOMICS AND LAW 234 (2009).

[77] *See* FED. COMMC'NS COMM'N, FINAL REPORT OF THE TELEPHONE RATE AND RESEARCH DEPARTMENT 7–8 (1938). For a useful overview, see Steven M. Spaeth, *Industrial Policy, Continuing Surveillance, and Raised Eyebrows: A Comparison of Informality in Administrative Procedure in Japan and the United States*, 20 OHIO N.U. L. REV. 931, 941–42 (1994).

[78] Carl I. Wheat, *The Regulation of Interstate Telephone Rates*, 51 HARV. L. REV. 846, 854 (1938).

[79] FED. COMMC'NS COMM'N, *supra* note 77, at 6–9.

[80] *See* Policy and Rules Concerning Rates for Dominant Carriers, Report and Order and Second Further Notice of Proposed Rulemaking, 4 FCC Rcd. 2873, 2884–85 ¶¶ 19–20 (1989) [hereinafter AT&T Price Cap Order].

[81] *See Pub. Utils. Comm'n v. United States*, 356 F.2d 236, 238–40 (9th Cir. 1966).

[82] *See GSA Requests Phone Rate Slash*, 61 PUB. UTIL. FORT. 467, 467 (1958).

[83] AT&T Co. and the Associated Bell System Companies Charges for Interstate and Foreign Communication Service, Memorandum Opinion and Order, 2 F.C.C.2d 871, 871 ¶ 1 (1965); *see supra* note 77 and accompanying text (explaining that the cost study conducted in August 1964 was indeed nearly thirty years after the FCC's creation pursuant to the Communications Act of 1934).

[84] AT&T Co. and the Associated Bell System Companies Charges for Interstate and Foreign Communication Service, Interim Decision and Order, 9 F.C.C.2d 30, 32–33 ¶ 1 (1967).

[85] *Id.* 37–38 ¶ 15.

[86] *See* Nicholas Johnson, *The Second Half of Jurisprudence: The Study of Administrative Decisionmaking*, 23 STAN. L. REV. 173, 186–87 (1970) (reviewing KENNETH CULP DAVIS, DISCRETIONARY JUSTICE: A PRELIMINARY INQUIRY (1969)).

1. Rate-of-Return Regulation. As the Supreme Court has noted, determining whether a particular rate is reasonable is an "embarrassing question."[87] Justice Brandeis similarly called assessing the reasonableness of rates a "laborious and baffling task."[88] The most accurate basis for determining the reasonableness of a rate would be to compare it to the prices charged for comparable products bought and sold in an open market.[89] The problem was that "utilities, unlike merchandise or land, are not commonly bought and sold in the market."[90] As a result, no such market benchmarks could exist. Another commonly used, market-based approach to valuation is calculating the net present value of the utility's earning stream. Capitalizing earnings necessarily embroiled regulatory authorities in a "vicious circle," since the rate would depend on the utility's earnings, and the earnings were largely determined by the rates the utility was permitted to charge.[91] "The heart of the matter is that rates cannot be made to depend upon 'fair value' when the value of the going enterprise depends on earnings under whatever rates may be anticipated."[92]

As a result, regulators must base their assessments on data other than market-based outcomes. To implement its new, more formal approach to evaluating the reasonableness of rates, the FCC naturally turned to the framework that state regulators had developed over the span of decades: rate-of-return regulation (also known as cost of service ratemaking).[93] Rate-of-return regulation focuses on the cost of the inputs rather than the value of the outputs according to the following formula:

$$R = O + Br,$$

where R is the total revenue the carrier is permitted to generate (sometimes called the revenue requirement), O is the carrier's operating expenses incurred during that particular rate year (such as taxes, wages, energy costs, and depreciation), B is the amount of capital investments that must be recovered over multiple rate years (also known as the "rate base"), and r is the appropriate rate of return allowed on the capital investment.[94]

Once the total revenue requirement is set, prices are set for each service in a manner designed to allow the firm to satisfy that requirement. If there is only one product and one rate class, rates are then determined simply by dividing the total revenue requirement by the number of units consumers are expected to demand.[95] If, as is usually the case, the regulated firm offers multiple products (e.g., local and long distance services) and more than one class of service (e.g.,

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87 *Smyth v. Ames*, 169 U.S. 466, 546 (1898).

88 *Missouri ex rel. Sw. Bell Tel. Co. v. Pub. Serv. Comm'n*, 262 U.S. 276, 292 (1923) (Brandeis, J., concurring).

89 *Cost or Price Analysis*, RESEARCH CORP. OF THE UNIV. OF HAW. § 2.125.2, https://www.rcuh.com/Webhelp/policies_and_procedures/2-procurement/2.125_cost_orprice_analysis_.htm (last updated Aug. 24, 2005).

90 *Sw. Bell Tel. Co.*, 262 U.S. at 292.

91 *Id.*

92 *Fed. Power Comm'n v. Hope Natural Gas Co.*, 320 U.S. 591, 601 (1944) (footnote omitted).

93 *See* Kathleen B. Levitz, *Loosening the Ties That Bind: Regulating the Interexchange Services Market for the 1990's*, (FCC Office of Plans & Pol'y, Working Paper, Mar. 9, 1987), *reprinted in* 2 FCC Rcd. 1495, 1496, 1502 n.2 (1987).

94 *See, e.g.*, RICHARD J. PIERCE, JR., ECONOMIC REGULATION: CASES AND MATERIALS 51–52 (1994).

95 *See* CHURCH & WARE, *supra* note 36, § 26.2.1, at 842–46.

residential and business services), the calculus is considerably more complex.[96] Regulators then monitor the overall revenue and profit earned by the regulated entity to make sure that unexpected variations do not cause major deviations from the targets.

Rate-of-return regulation has been the subject of widespread criticism. For example, the National Telecommunications and Information Administration states: "Almost from its inception, there has been criticism of this traditional, and predominant, communications regulatory tool. Since the early 1960s, a number of economists have identified and, in some cases, sought to quantify, the excessive costs attributable to rate of return regulation."[97] Crandall and Waverman similarly observe, "The disadvantages of [rate-of-return] regulation . . . have been well identified in the literature."[98] The FCC has been trying to develop alternative methodologies since the late 1970s.[99]

More recently, regulators have begun to move away from formal tariffs for nondominant firms. For example, the FCC attempted to exempt MCI and Sprint from tariff filings because they lacked a dominant position.[100] As AT&T lost its dominant position, the FCC eventually attempted to allow AT&T to comply only with the tariff procedures for nondominant carriers.[101] The courts rejected the FCC's actions, holding that the statute required the filing of tariffs and did not give the FCC the power to create exceptions.[102]

Congress eventually amended the statute to give the FCC the discretion to forbear from enforcing the statutory tariff requirements whenever the agency finds that tariffs are not necessary to protect consumers or to ensure reasonable and nondiscriminatory rates and that forbearing would be in the public interest.[103] The FCC has exercised its forbearance authority to completely detariff long-distance services rates.[104] After initially ruling to the contrary,[105] the FCC has also ruled that local telephone companies do not have a dominant position in digital

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96 *See id.* § 26.2.1, at 845–47; 1 KAHN, *supra* note 68, at 150–52; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 443–45.

97 NAT'L TELECOMMS. & INFO. ADMIN., U.S. DEP'T OF COMMERCE, NTIA REGULATORY ALTERNATIVES REPORT 10 (1987), *available at* http://www.its.bldrdoc.gov/publications/87-222.aspx;.

98 ROBERT W. CRANDALL & LEONARD WAVERMAN, TALK IS CHEAP: THE PROMISE OF REGULATORY REFORM IN NORTH AMERICAN TELECOMMUNICATIONS 98 (1995).

99 AT&T Price Cap Order, *supra* note 80, at 2888–89 ¶¶ 27–28, 2891–93 ¶¶ 34–35.

100 Tariff Filing Requirements for Nondominant Carriers, Notice of Proposed Rulemaking, 8 FCC Rcd. 1395, 1396 ¶ 6, 1399 ¶ 28 (1993); Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor, Sixth Report and Order, 99 F.C.C.2d 1020, 1035 ¶ 26, 1036 app. A (1985), *vacated and remanded sub nom. MCI Telecomms. Corp. v. FCC*, 765 F.2d 1186, 1195–96 (D.C. Cir. 1985); Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor, Second Report and Order, 91 F.C.C.2d 59, 65 ¶ 12, 73 ¶ 30, 74 ¶ 32 (1982).

101 Motion of AT&T Corp. to Be Reclassified as a Non-Dominant Carrier, Order, 11 FCC Rcd. 3271, 3273 ¶¶ 1–2, 3281 ¶ 12, 3282 ¶ 13 (1995).

102 *MCI Telecomms. Corp. v. AT&T Co.*, 512 U.S. 218, 231–32, 234 (1994); *Sw. Bell Corp. v. FCC*, 43 F.3d 1515, 1517, 1526 (D.C. Cir. 1995); *AT&T Co. v. FCC*, 978 F.2d 727, 729 (D.C. Cir. 1992); *MCI Telecomms. Corp.*, 765 F.2d at 1187–88.

103 47 U.S.C. § 160(a) (2012).

104 Policy and Rules Concerning the Interstate, Interexchange Marketplace, Implementation of Section 254(g) of the Communication Act of 1934, as Amended, Second Report and Order, 11 FCC Rcd. 20730, 20731–33 ¶¶ 1, 3 (1996), *petition for review denied sub nom. MCI WorldCom, Inc. v. FCC*, 209 F.3d 760, 761, 763, 766 (D.C. Cir. 2000).

105 GTE Tel. Operating Cos., GTOC Tariff No. 1, GTOC Transmittal No. 1148, Memorandum Opinion and Order, 13 FCC Rcd. 22466, 22466 ¶¶ 1–2, 22474–76 ¶¶ 16–19 (1998).

subscriber lines (DSL) and thus do no need to file tariffs for those services.[106] Instead, carriers simply have to post their terms of service on their website.[107]

a. Determining the Proper Rate Base. One of the most longstanding challenges is determining how to value capital expenses that comprise the rate base (*B*). Establishing the proper way to determine the value of the cost of the rate base has proven to be one of the most difficult problems in economic regulation.[108] Indeed, in *Verizon Communications Inc. v. FCC*, the Supreme Court characterized the word "cost" as "a chameleon," "virtually meaningless," and "protean."[109]

The biggest controversy has surrounded whether the rate base should be calculated based on historical cost or replacement cost.[110] *Munn v. Illinois* originally eschewed any judicial involvement in evaluating the reasonableness of rates, insisting that that was the province of legislatures.[111] The Supreme Court changed course in the landmark case of *Smyth v. Ames*, which held that the Constitution entitled regulated firms to rates based on the "fair value" of their assets.[112] And by fair value, the Court meant the assets' current market value as measured by replacement cost.[113]

More recently, regulatory authorities have begun to turn an even more stringent form of replacement cost, exemplified by the FCC's adoption of Total Element Long-Run Incremental Cost (TELRIC), used to implement rates set under the Telecommunications Act of 1996.[114] This calculation was based not on the replacement cost of the assets actually purchased, but rather on the replacement cost of the most efficient technology available at the time that rates were being set.[115] In other words, TELRIC bases rates not on the replacement cost of the actual network, but rather on that of a hypothetical network based around the most efficient components if the network were rebuilt from scratch today.[116]

The contrary position received its canonical statement in Justice Brandeis's landmark concurrence in *Missouri* ex rel. *Southwestern Bell Telephone Co. v. Public Service Commission*.[117] Brandeis recognized that replacement cost might well represent the best evidence of present value, as it would reflect changes in demand and technology occurring after the assets were originally purchased.[118] The problem was that determining replacement cost, however, was an inherently speculative endeavor fraught with uncertainty. Instead, Brandeis advocated relying

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106 Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd. 14853, 14862–65 ¶¶ 12–17 (2005), *petition for review denied sub nom. Time Warner Telecom, Inc. v. FCC*, 507 F.3d 205, 208 (3d Cir. 2007).

107 *Id.* 14901 ¶ 90.

108 *See* 1 KAHN, *supra* note 68, at 45–51.

109 *Verizon Commc'ns Inc. v. FCC*, 535 U.S. 467, 500–01 (2002) (internal quotation marks omitted).

110 *See* SPULBER & YOO, *supra* note 76, at 127–28.

111 *Munn v. Illinois*, 94 U.S. 113, 133–34 (1876).

112 *Smyth v. Ames*, 169 U.S. 466, 546 (1898).

113 *See* Stephen A. Siegel, *Understanding the* Lochner *Era: Lessons from the Controversy over Railroad and Utility Rate Regulation*, 70 VA. L. REV. 187, 227–32 (1984).

114 *Verizon*, 535 U.S. at 491–97 & n.16; 47 C.F.R. § 51.505(b) (2012); *see also* Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56.

115 47 C.F.R. § 51.505(b)(1).

116 Although TELRIC requires determining replacement costs of the hypothetically most efficient assets, it does not require basing rates on the hypothetically most efficient locations. *See id.* In recognition that locations of central offices cannot easily be moved, it takes the locations of the existing wire centers as given. *See id.*

117 *Missouri ex rel. Sw. Bell Tel. Co. v. Pub. Serv. Comm'n*, 262 U.S. 276, 299–302 (1923) (Brandeis, J., concurring).

118 *Id.*

on historic cost for the pragmatic reason that it was less subjective and less susceptible to manipulation.[119]

Rather than resolve this controversy, the Supreme Court instead chose to abandon the enterprise of evaluating rates altogether. Beginning in *Federal Power Commission v. Hope Natural Gas Co.*, the Supreme Court invoked notions of judicial deference and restraint to uphold any rate, whether based on historical or replacement cost, so long as it fell within a broad zone of reasonableness.[120]

The problem is that the debate between historical and replacement cost is not merely academic. The choice between them can have dramatic implications for both the rates paid by consumers and the returns earned by companies. For example, when *Smyth* was decided, the country was in the midst of a depression, and in this deflationary environment, replacement costs meant lower rates, and historical cost meant higher rates.[121] In following years, replacement cost tended to cause rates to increase, particularly during World Wars I and II.[122] Indeed, during times of inflation, replacement cost methodologies can provide regulated firms with a windfall. In addition, the uncertainty surrounding replacement cost determinations, and particularly those made around hypothetical combinations of assets, made rate hearings costly and maddeningly inconsistent in terms of results.[123] As noted later, it can be particularly difficult to apply when technology is in a state of flux.

The result is that, aside from TELRIC, regulatory authorities have ended their endless fights over how best to determine replacement cost and generally relied on more stable and less arbitrary measures of historical cost.[124] Historical cost is not without its own drawbacks, however. Guaranteeing a return on outdated technology can reward obsolescence.[125] As such, one of the most difficult administrative problems associated with common carriage regulation remains unresolved.

b. The Lack of Incentive to Economize on Costs. A widely cited problem with rate-of-return regulation is that the regulated firm has no incentive to economize on costs. The cost-plus nature guarantees the firm a return on its expenditures, which dampens their incentive to economize as well as their incentive to invest in cost-reducing improvements.[126] Firms subject to rate regulation may also avoid deploying new technologies that would render its investments in its rate base obsolete before they have the chance to recover those costs.[127]

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119 *See id.* at 308–10; *see also* 1 KAHN, *supra* note 68, at 39 & nn.40–41.

120 320 U.S. 591, 602 (1944). *See generally* SPULBER & YOO, *supra* note 76, at 128.

121 *See* 1 KAHN, *supra* note 68, at 39; Siegel, *supra* note 113, at 222–23.

122 *See* 1 KAHN, *supra* note 68, at 40; Siegel, *supra* note 113, at 233–34.

123 Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, Notice of Proposed Rulemaking, 18 FCC Rcd. 18945, 18948–49 ¶¶ 6–7 (2003); *see also* Shelanski, *supra* note 25, at 79–80.

124 1 KAHN, *supra* note 68, at 39, 41–42; *see also* CHURCH & WARE, *supra* note 36, § 26.2.1, at 844.

125 SPULBER & YOO, *supra* note 76, at 225–26.

126 Policy and Rules Concerning Rates for Dominant Carriers, Second Report and Order, 5 FCC Rcd. 6786, 6789 ¶ 22 (1990) [hereinafter LEC Price Cap Order], *petition for review dismissed sub nom. Nat'l Rural Telecom Ass'n v. FCC*, 988 F.2d 174, 177 (D.C. Cir. 1993); AT&T Price Cap Order, *supra* note 80, 2889–90 ¶¶ 29–30; CHURCH & WARE, *supra* note 36, § 26.2.2, at 847, § 26.2.3, at 852; CRANDALL & WAVERMAN, *supra* note 98, at 100; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 27–29; 2 KAHN, *supra* note 134, at 48; SPULBER & YOO, *supra* note 76, at 129; John Haring & Evan Kwerel, *Competition Policy in the Post-Equal Access Market* (FCC Office of Plans & Pol'y, Working Paper, 1987), *available at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp22.pdf.

127 NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 19–20, 27, 29; *see* CHURCH & WARE, *supra* note 36, § 26.2.3, at 848–49.

Conversely, regulated firms may overspend on quality to avoid interruptions that would weaken political support or undertake costs that would make management processes and labor relations easier.[128] Regulators attempt to curb inappropriate expenditures by only allowing carriers to recover investments that were "prudent," usually determined by whether the asset for which recovery is sought is "used and useful."[129] Realistically, this authority enables regulators to catch only the most egregious of excesses.[130] And in any event, it can never evaluate investments that were never made but should have been.

Moreover, ex post evaluation always runs the risk of hindsight bias, denying recovery of investments and expenditures that were prudent at the time they were undertaken but ended up not panning out.[131] The problem is that once investments are sunk, regulated firms are vulnerable to regulatory opportunism should regulators arbitrarily strand costs by finding them to be imprudent.[132] The risk of such expropriation can cause firms to underinvest systematically in their networks.[133]

A closer review of the literature reveals a number of subtleties. Consider the role of regulatory lag. The natural instinct is to regard it as a shortcoming because delays in updating rates can cause them to deviate from reasonable cost. During the period between rate hearings, however, prices no longer depend on costs.[134] As a result, the regulated firm can keep any cost savings it is able to achieve, providing some limited incentive to economize.[135] Of course, this incentive varies with the length of time remaining until the next rate hearing.[136] As the rate hearing approaches, the incentive to keep costs down weakens.[137]

In addition, the guarantee of a rate of return may create a moral-hazard problem that gives regulated firms excess incentives to undertake risky projects.[138] If so, reviewing expenditures for prudence may actually bring investment closer to optimal levels.[139] Indeed, pre-

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128 CHURCH & WARE, *supra* note 36, § 26.2.3, at 848–49, 852, 2 KAHN, *supra* note 134, at 50, 53; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 27. For a review of the empirical literature, see Paul L. Joskow & Nancy L. Rose, *The Effects of Economic Regulation*, *in* 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1450, 1484–86 (Richard Schmalensee & Robert D. Willig eds., 1989).

129 *See, e.g.*, JAMES C. BONBRIGHT, ALBERT L. DANIELSEN & DAVID R. KAMERSCHEN, PRINCIPLES OF PUBLIC UTILITY RATES 257–58 (2d ed. 1988); SPULBER & YOO, *supra* note 76, at 129.

130 *See* CHURCH & WARE, *supra* note 36, § 26.2.2, at 851–52; 2 KAHN, *supra* note 134, at 47; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 27–28.

131 Daniel F. Spulber & Christopher S. Yoo, *Toward a Unified Theory of Access to Local Telephone Networks*, 61 FED. COMM. L.J. 43, 84 (2008).

132 Christopher S. Yoo, *Vertical Integration and Media Regulation in the New Economy*, 19 YALE J. ON REG. 171, 294–95 (2002).

133 Thomas P. Lyon, *Regulation with 20-20 Hindsight: "Heads I Win, Tails You Lose"?*, 22 RAND J. ECON. 581, 581–82 (1991) (citing John Panzar).

134 *See* 2 ALFRED E. KAHN, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 48 (1971) (discussing regulatory lag).

135 DENNIS W. CARLTON & JEFFREY M. PERLOFF, MODERN INDUSTRIAL ORGANIZATION 669 (3d ed. 2000); 2 KAHN, *supra* note 134, at 48; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 432–33; *see* Paul L. Joskow, *Inflation and Environmental Concern: Structural Change in the Process of Public Utility Price Regulation*, 17 J.L. & ECON. 291, 294 (1974).

136 *See* STEPHEN G. BREYER, REGULATION AND ITS REFORM 48 (1982).

137 *Id.*

138 *See* H. Stuart Burness, W. David Montgomery & James P. Quirk, *Capital Contracting and the Regulated Firm*, 70 AM. ECON. REV. 342, 349–50 (1980).

139 Lyon, *supra* note 133, at 582, 584, 586–88, 591.

committing a "used and useful" regime may benefit common carriers by preventing regulatory authorities from increasing the costs they declare to be imprudent.[140]

c. Determining the Proper Rate of Return. Determining the appropriate rate of return often proves even more difficult than determining the appropriate rate base.[141] The regulator must decide whether to focus on the regulated entity's cost of capital or that of represented industry participants.[142] The regulator must determine whether to evaluate the current risk level or the one at the time the capital expenditures were made.[143] In determining the weighted average cost of capital, regulators must take into account the different tax treatment of each instrument.[144] They must also decide whether the risk premium includes protection against inflation or reflects pioneering new services that are not yet proven.[145] This determination is complicated by the fact that small differences in rates of return can have dramatic effects on the total revenue that the carrier is allowed to generate.[146]

In the end, setting rates of return is as much about a political bargain allocating benefits between consumers and firms as it is about economics.[147] It should thus come as no surprise that firms that practice in multiple jurisdictions often find wide variance in the rate of return they are permitted to earn.[148]

d. Overcapitalization and the Averch-Johnson Effect. In addition to debates over how best to determine the rate base and the rate of return, debates over rate-of-return regulation have been dominated by concerns that the ratemaking formula may be creating systematic biases in firm behavior.[149] The most famous such bias is the Averch-Johnson effect, which suggests that firms will favor capital-intensive solutions over solutions that emphasize operating costs, such as labor.[150] This is because the ratemaking formula allows regulated firms to earn a rate of return on its capital expenses, whereas operating expenses are reimbursed dollar-for-dollar without any additional markup.[151] So long as the regulated rate of return exceeds the firm's actual cost of capital, it should find it profitable to do so.[152]

Stated slightly more formally, an unregulated firm would increase its use of both labor and capital until the marginal cost of each factor equals the marginal value that it generates.[153] The constraint mentioned above that the regulated rate of return exceeds the actual cost of capital exaggerates the profit signal for capital, which means that the firm will increase its use of capital beyond the socially optimal point, at which point production no longer employs the socially optimal mix.[154]

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140 *See* Richard J. Gilbert & David M. Newbery, *The Dynamic Efficiency of Regulatory Constitutions*, 25 RAND J. ECON. 538, 538–39, 547–48, 551 (1994) (internal quotation marks omitted).

141 SPULBER & YOO, *supra* note 76, at 129.

142 1 KAHN, *supra* note 68, at 45–46.

143 *Id.* at 46.

144 *Id.* at 50–51.

145 *Id.* at 51.

146 SPULBER & YOO, *supra* note 76, at 129.

147 CHURCH & WARE, *supra* note 36, § 26.2.1, at 844; 1 KAHN, *supra* note 68, at 42–44.

148 NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 14.

149 SPULBER & YOO, *supra* note 76, at 129.

150 Harvey Averch & Leland L. Johnson, *Behavior of the Firm Under Regulatory Constraint*, 52 AM. ECON. REV. 1052, 1068 (1962).

151 *See id*. at 1053–54.

152 *See id.*

153 *Id.* at 1055–56.

154 *Id.* at 1053, 1057.

While conceptually appealing, the Averch-Johnson effect is subject to a number of caveats.[155] As an initial matter, the effect may compensate for the fact that uncertainty dictates that some capital investments may not pan out.[156] In addition, the effect does not occur if management seeks to maximize revenue instead of profits.[157]
Moreover, a necessary condition for the effect to occur is that the regulated rate of return exceeds the firm's cost of capital, otherwise all capital investments will be unprofitable, and the firm will exit the market.[158] Consequently, the effect will not occur if inflation temporarily causes the firm's cost of capital to rise above the regulated rate of return after the rate is set.[159] In addition, any tendency toward overcapitalization may be offset if raising larger amounts of capital causes capital costs to rise.[160]

Other factors may create downward pressure on capital costs. The extent to which regulators provide higher rates of return when rates are stable or declining may give firms the incentive to reduce costs.[161] Moreover, during the lag when prices are fixed, firms can increase profits by cutting costs.[162] In addition, regulatory authorities may disallow certain capital expenditures as imprudent.[163]

Another exception follows from Averch and Johnson's second finding, which is typically overlooked in the literature. If the firm can use the same inputs to make a second product, it can also earn a rate of return that exceeds its cost of capital by entering that market as well.[164] Indeed, it has the incentive to do so even if it runs a loss, so long as the difference between the regulated rate of return and the actual cost of capital exceeds the margin of the loss.[165] To the extent that regulation is imperfect and regulated firms are still able to exercise monopoly power, the tendency to expand output and price below marginal cost may actually be beneficial.[166]

Given this multitude of considerations, it comes as no surprise that empirical tests of the Averch-Johnson effect are all over the map.[167] Some studies confirm a tendency toward overcapitalization.[168] Others find undercapitalization[169] or are inconclusive.[170]

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155 *See* NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 25–26.

156 2 KAHN, *supra* note 134, at 56–57.

157 Elizabeth E. Bailey & John C. Malone, *Resource Allocation and the Regulated Firm*, 1 BELL J. ECON. & MGMT. SCI. 129, 137–38 (1970).

158 Averch & Johnson, *supra* note 150, at 1054–55.

159 Leland L. Johnson, *Behavior of the Firm Under Regulatory Constraint: A Reassessment*, 63 AM. ECON. REV. 90, 90, 95 (1973); *see also* Paul L. Joskow & Richard Schmalensee, *Incentive Regulation for Electric Utilities*, 4 YALE J. ON REG. 1, 7 & n.29 (1986) ("Due to regulatory lag, the actual rates of return . . . may be above or below the commission-determined fair rate of return at any instant.").

160 2 KAHN, *supra* note 134, at 57–58.

161 *Id.* at 57.

162 Joskow & Schmalensee, *supra* note 159, at 7–8.

163 VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 462; Joskow & Schmalensee, *supra* note 159, at 8.

164 *See* Averch & Johnson, *supra* note 150, at 1058–59.

165 *Id.* at 1059.

166 2 KAHN, *supra* note 134, at 106–07.

167 *See* CARLTON & PERLOFF, *supra* note 135, at 676; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 26; Joskow & Rose, *supra* note 128, at 1477–79.

168 *See* CARLTON & PERLOFF, *supra* note 135, at 676; Leon Courville, *Regulation and Efficiency in the Electric Utility Industry*, 5 BELL J. ECON. & MGMT. SCI. 53, 72 (1974); Jean Mirucki, *A Study of the Averch-Johnson Hypothesis in the Telecommunications Industry*, 12 ATLANTIC ECON. J. 121, 121 (1984); H.C. Petersen, *An Empirical Test of Regulatory Effects*, 6 BELL J. ECON. 111, 124 (1975); Robert M. Spann, *Rate of Return Regulation and Efficiency in Production: An Empirical Test of the Averch-Johnson Thesis*, 5 BELL J. ECON. & MGMT. SCI. 38, 50 (1974).

Despite these caveats, the general consensus is that the Averch-Johnson effect does affect firm behavior, even if disagreement still exists as to its direction and magnitude.[171] Whatever the precise impact of the effect, it does underscore that introducing regulation would distort decisions away from those that marketplace participants would make in the absence of regulation.

e. Setting Prices and Allocating Common Costs. The dynamism of Internet-related markets makes it more difficult to set prices in an efficient manner. As noted earlier, the most straightforward way to generate individual prices is to divide the revenue requirement by the projected demand.[172] This yields a good result when industry demand and market shares are relatively stable. When demand is uncertain, however, prices may give the regulated firm a windfall if demand unexpectedly spikes, or it may fail to meet the revenue requirement if demand fails to meet expectations.

Another classic problem associated with rate-of-return regulation is the reduction in pricing flexibility.[173] As the user base becomes more heterogeneous, users will want an increasingly diverse range of increasingly customized products.[174] Some consumers may be willing to pay high prices for more features or higher quality. Others may wish to buy a no-frills version at a cheaper price. The creation of new products will inevitably require the regulatory approval of new price-product combinations. The inevitable lag means that regulation will cause the product offerings and prices to be increasingly out of step with consumer demand.[175] The faster the rate of change, the more significant this wedge will become.

Regulated pricing suffers from an even more fundamental problem. Because the approach to pricing described above simply divides total cost by total quantity,[176] it represents a classic example of average cost pricing. As such, it deviates from the benchmark of marginal cost pricing that represents the central policy prescription of microeconomics.[177] Of course, when fixed costs are high, it is impossible to charge prices that both equal marginal cost and equal or exceed average cost.[178] In that case, Ramsey pricing indicates that the most efficient outcome would be to charge in inverse proportion to the elasticity of demand.[179] Again, the average-cost approach to pricing embedded in rate-of-return regulation is at odds with this outcome.

The problem becomes much worse if the same assets are used to produce more than one service.[180] When this occurs, basic principles of cost causality require that costs associated

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169 *See* David P. Baron & Robert A. Taggart, Jr., *A Model of Regulation Under Uncertainty and a Test of Regulatory Bias*, 8 BELL J. ECON. 151, 164–65 (1977).

170 *See* CARLTON & PERLOFF, *supra* note 135, at 676; Randy A. Nelson & Mark E. Wohar, *Regulation, Scale Economies, and Productivity in Steam-Electric Generation*, 24 INT'L ECON. REV. 57, 74–75 (1983); Charles W. Smithson, *The Degree of Regulation and the Monopoly Firm: Further Empirical Evidence*, 44 S. ECON. J. 568, 579 (1978).

171 2 KAHN, *supra* note 134, at 50, 59; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 26.

172 *See supra* note 95 and accompanying text.

173 LEC Price Cap Order, *supra* note 126, 6791 ¶ 35; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 17.

174 YOO, *supra* note 39, at t 16–18.

175 Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1, 52 (2005).

176 *See supra* text accompanying notes 95, 172.

177 *See supra* note 68 and accompanying text.

178 *See supra* Figure 2; *supra* text accompanying notes 70–73.

179 *See supra* text accompanying notes 70–73.

180 *See* LEC Price Cap Order, *supra* note 126, 6789 ¶ 22; CRANDALL & WAVERMAN, *supra* note 98, at 109; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 13–14.

exclusively with one product be allocated to that product. All of the other costs are regarded as common costs.[181] The question is by what metric those common costs should be allocated to individual products.

The classic answer is to allocate them on the basis of some observable measure of utilization (such as minutes), revenue, or attributable cost assigned to each service.[182] These are merely projections, and any deviation in fact can cause the firm to run a deficit. In addition, the choice among these measures is fundamentally arbitrary but has important consequences for the prices charged each class of customers.[183] A more fundamental problem is that these measures are extremely unlikely to bear any resemblance to marginal cost.[184]

Finally, the landmark article by Nobel Laureate George Stigler and Claire Friedland has launched an empirical literature assessing whether rate regulation actually lowers prices.[185] Although a burgeoning literature has emerged, it has not provided any simple policy inferences.[186]

f. Variations in Product and Service Quality. As noted earlier, nondiscrimination mandates work best when the product being regulated is a commodity and is created through a uniform production technology.[187] When product quality and production costs vary, it can be very difficult to determine when price differentials are not justified by differences in cost.

A similar effect arises with respect to rate regulation of monopolies. A regulated firm prevented by rate regulation from charging higher prices can still increase its profits simply by degrading quality.[188] Indeed, empirical studies indicate that this is precisely what occurred in the cable television industry, when rate regulation actually caused quality-adjusted cable rates to rise.[189] Conversely, if the rate-regulated firm is operating in a competitive (presumably oligopolistic) environment, the inability to compete on price may naturally lead it to compete based on quality.[190]

The only alternative would be to regulate quality as well. The problem is that quality requirements would be notoriously hard to specify, let alone monitor and enforce, and even then they would have bite only when the party in question was blatantly deficient.[191]

g. The Impact on Innovation. Firms subject to rate-of-return regulation have often been criticized for their failure to innovate.[192] As an initial matter, regulated firms may be

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[181] CHURCH & WARE, *supra* note 36, § 26.2.1, at 846; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 443.

[182] CHURCH & WARE, *supra* note 36, § 26.2.1, at 846; 1 KAHN, *supra* note 68, at 151; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 443.

[183] VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 443–45.

[184] 1 KAHN, *supra* note 68, at 151–52; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 444.

[185] George J. Stigler & Claire Friedland, *What Can Regulators Regulate? The Case of Electricity*, 5 J.L. & ECON. 1, 4 (1962).

[186] *See* Joskow & Rose, *supra* note 128, at 1464, 1473–74.

[187] *See supra* note 36 and accompanying text.

[188] *See* David Besanko, Shabtai Donnenfeld & Lawrence J. White, *Monopoly and Quality Distortion: Effects and Remedies*, 102 Q.J. ECON. 743, 743–44, 756–57 (1987); David Besanko, Shabtai Donnenfeld & Lawrence J. White, *The Multiproduct Firm, Quality Choice, and Regulation*, 36 J. INDUS. ECON. 411, 418 (1988); Kenneth S. Corts, *Regulation of a Multi-Product Monopolist: Effects on Pricing and Bundling*, 43 J. INDUS. ECON. 377, 393–95 (1995).

[189] *See* THOMAS W. HAZLETT & MATTHEW L. SPITZER, PUBLIC POLICY TOWARD CABLE TELEVISION: THE ECONOMIES OF RATE CONTROLS 61–63 (1997); Gregory S. Crawford, *The Impact of the 1992 Cable Act on Household Demand and Welfare*, 31 RAND J. ECON. 422, 444–45 (2000).

[190] 677–78 & n.33; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 564–66.

[191] 1 KAHN, *supra* note 68, at 22; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 361–62.

reluctant to deploy innovations when doing so would obsolete existing equipment that has not been fully amortized. Moreover, the fact that its return is capped means that it benefits little from innovations that improve profitability.[193]

Moreover, innovative activity typically carries greater risks than the firm's existing lines of business, with the risk levels also varying from innovation to innovation. If the rate-of-return formula applies a single, uniform rate of return, the regulated entity has little incentive to pursue ventures in which the risk exceeds the rate-of-return benchmark imposed by the authorities. Conversely, the possibility that an investment may be declared imprudent may deter regulated firms from pursuing innovations with higher risk.[194]

Other commentators find some incentive to innovate in some areas.[195] Some argue that rate regulation induces firms to pursue innovations that increase the productivity of labor over capital.[196] Others find the theory to be ambiguous.[197] The empirical evidence is probably best characterized as thin and inconclusive.[198]

h. Asymmetric Information. A related problem endemic to rate-of-return regulation is that all of the information needed to set rates is typically under the control of the firm being regulated.[199] Because the firm's interests are not completely aligned with the regulator's, this information asymmetry gives rise to a classic principal–agent problem in which the principal (the regulator) has limited ability to obtain and verify the relevant information as well as a limited number of inducements to alter the behavior of the agent (the regulated firm).[200]

i. Compliance Costs. The final drawback of rate-of-return regulation is its costs. A 1987 NTIA study estimated compliance costs at $8 to $10 per line per year for an annual cost of $1.1 billion.[201] In addition, a local telephone company reported that the state public utility commission took an average of 329 days to approve its tariffs, with a peak of 390 days. A major federal rate proceeding took three years.[202]

2. Price Caps. The problems associated with rate-of-return regulation led regulatory authorities to experiment with an alternative rate-setting regime known as "price caps." Simultaneously developed in the early 1980s in the United Kingdom by government economist Stephen Littlechild[203] and in the United States by AT&T researchers Peter Linhart, Roy Radner, and Frank Sinden,[204] the scheme was deployed in the United Kingdom in 1984 and in the United

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192 Haring & Kwerel, *supra* note 126, at 9.

193 NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 19.

194 Thomas P. Lyon, *Regulatory Hindsight Review and Innovation by Electric Utilities*, 7 J. REG. ECON. 233, 233–37 (1995).

195 NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 18–19; V. Kerry Smith, *The Implications of Regulation for Induced Technical Change*, 5 BELL J. ECON. & MGMT. SCI. 623, 628 (1974).

196 *See* Smith, *supra* note 195, at 628.

197 *See* Wesley A. Magat, *Regulation and the Rate and Direction of Induced Technical Change*, 7 BELL J. ECON. 478, 478–79, 490 (1976); Koji Okuguchi, *The Implications of Regulation for Induced Technical Change: Comment*, 6 BELL J. ECON. 703, 703–05 (1975).

198 Joskow & Rose, *supra* note 128, at 1482–84.

199 CRANDALL & WAVERMAN, *supra* note 98, at 101; SPULBER & YOO, *supra* note 76; Shelanski, *supra* note 25, at 78.

200 CRANDALL & WAVERMAN, *supra* note 98, at 101; Shelanski, *supra* note 25, at 78.

201 NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 23–24.

202 *Id.* at 16.

203 *See* STEPHEN C. LITTLECHILD, REGULATION OF BRITISH TELECOMMUNICATIONS PROFITABILITY ¶¶ 13.4, 13.6, 13.12, 13.16, at 1234–36 (1983) (detailing the "local tariff reduction scheme," now known as price caps).

204 *See* Peter B. Linhart & Roy Radner, *Deregulation of Long-Distance Telecommunications*, *in* POLICY RESEARCH IN TELECOMMUNICATIONS 102, 108–11 (Vincent Mosco ed., 1984); Peter B. Linhart, Roy Radner &

States in 1989.[205] By 2003, it had been adopted by 40 states before the onset of the trend towards deregulation.[206]

The principles underlying price caps are relatively straightforward. The primary source of the disincentive to economize was the fact that prices were tied to costs, such that any increase in efficiency would lead directly to a reduction in revenue.[207] Price caps are designed to make the prices a firm can charge independent of any reductions in cost.[208] In addition, price caps were supposed to mitigate the principal–agent problem by shifting the focus to information that was more externally observable and verifiable and by giving the regulator the ability to offer the regulated firm higher-powered incentives.[209]

The basic strategy was to regulate prices, not profits or revenues, and to do so based on information that was not firm-specific. The formula for determining the change from maximum price allowed during the previous year is:

$$\Delta P = CPI - X,$$

where *CPI* is an adjustment for inflation based on the consumer price index and *X* is a factor set by the regulator to reflect increases in productivity.[210] The maximum price could also be adjusted to reflect other exogenous changes outside the control of the regulated firm.[211]

The hope was that by basing adjustment to prices on an index of inflation as well as an estimate of improvements in industry productivity, price caps would lower the information required by agencies to regulate rates.[212] Price caps also promised to eliminate many of the systematic biases inherent in rate-of-return regulation. Because rates did not depend on costs, price caps would give regulated firms the incentive to economize on costs and would eliminate arguments over how to calculate the rate base and the proper rate of return.[213] It would also eliminate the bias in favor of capital expenditures over operating expenditures identified by Averch and Johnson and would obviate the need to allocate common costs across products.[214] Moreover, because the regulated firm would retain the benefits of its efforts, it was hoped that price caps would make regulated firms more innovative.[215]

Price caps can also promote pricing flexibility by allowing the maximum price to apply to a basket of goods rather than to individual products. Overall prices would comply with the price

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Frank W. Sinden, *A Sequential Mechanism for Direct Price Regulation*, *in* PRICE CAPS AND INCENTIVE REGULATION IN TELECOMMUNICATIONS 130 (Michael A. Einhorn ed., 1991); *see also* P.B. Linhart, R. Radner & F.W. Sinden, *A Sequential Principal-Agent Approach to Regulation* (Bell Labs. Econ. Discussion Paper No. 264, 1983), *available at* http://pages.stern.nyu.edu/~rradner/publishedpapers/53SequentialApproachRegulation.pdf.

[205] AT&T Price Cap Order, *supra* note 80, 2884 ¶ 18.

[206] David E.M. Sappington & Dennis L. Weisman, *Price Cap Regulation: What Have We Learned from 25 Years of Experience in the Telecommunications Industry?*, 38 J. REG. ECON. 227, 232 tbl.2, 233–34 (2010).

[207] VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 439.

[208] *Id.*; Sappington & Weisman, *supra* note 206, at 230.

[209] Mark A. Jamison, *Regulation: Price Cap and Revenue Cap*, *in* 1 ENCYCLOPEDIA OF ENERGY ENGINEERING AND TECHNOLOGY 1245, 1246 (Barney L. Capehart ed., 2007).

[210] *Id.* at 1246–48; Sappington & Weisman, *supra* note 206, at 229.

[211] VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 439–40; Sappington & Weisman, *supra* note 206, at 240–41.

[212] CHURCH & WARE, *supra* note 36, § 26.2.3, at 854.

[213] *Id.* § 26.2.3, at 853–54.

[214] Ronald R. Braeutigam & John C. Panzar, *Diversification Incentives under "Price-Based" and "Cost-Based" Regulation*, 20 RAND J. ECON. 373, 375–77 (1989).

[215] CHURCH & WARE, *supra* note 36, § 26.2.3, at 854.

cap so long as the weighted average of the prices of those goods fell below the relevant threshold.[216] This left regulated firms considerable latitude to vary the prices they charge for different goods as well as to engage in regimes such as Ramsey pricing.[217]

Although price caps were once regarded as something of a panacea, later scholars suggested that the concept had been "oversold,"[218] with each component posing its own challenges. Consider first the adjustment for inflation. The inflation index used to make this adjustment must be independent of the firm in order avoid problems of endogeneity.[219] For example, under the FCC's price cap scheme, the inflation index is measured by the Gross National Product Price Index.[220] While the avoidance of endogeneity is critical, the fact that it does not represent inflation in any particular sector means that it will not reflect the true changes in any one industry. If so, the adjustments set may create either windfalls or shortfalls for regulated firms. The uncertainty surrounding the approximate index has deterred the adoption of price caps.[221] Indeed, the errant index problem has been compared to Russian Roulette.[222]

Uncertainty about costs also limits the benefits of price caps.[223] If cost reductions are not observable by regulators, they may be forced to include a cushion in the price caps to make sure that regulated firms cover their costs.[224] The larger the uncertainty, the larger this cushion must be.[225] Driving prices further away from marginal cost maintains incentives for cost reduction (and thus productive efficiency) at the expense of allocative inefficiency.[226] At certain levels of uncertainty, rate-of-return regulation becomes preferable.[227] Cost-based pricing will be more allocatively efficient, but at the cost of weaker incentives to maximize productive efficiency.[228]

But the biggest challenge has been in determining how to set the *X* factor.[229] Regulators and commentators have struggled with the proper way to calibrate the *X* factor.[230] Those setting price caps must thread a needle. Setting the *X* factor too low will simply provide a windfall to network providers without yielding benefits to consumers. On the other hand, setting the *X* factor too high would deny providers a reasonable return and reduce incentives to invest.[231]

Even more problematic is the extent to which price caps can also leave regulated firms vulnerable to regulatory opportunism. As noted earlier, the *X* factor has traditionally included an additional increase beyond actual productivity gains to ensure that consumers share in the

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216 *Id.* § 26.2.3, at 853.

217 *Id.* § 26.2.3, at 854.

218 Richard Schmalensee, *Good Regulatory Regimes*, 20 RAND J. ECON. 417, 434 (1989).

219 *See* CHURCH & WARE, *supra* note 36, § 26.2.3, at 853.

220 LEC Price Cap Order, *supra* note 126, 6792 ¶ 50.

221 James M. MacDonald, John R. Norsworthy & Wei-Hua Fu, *Incentive Regulation in Telecommunications: Why States Don't Choose Price Caps*, *in* INCENTIVE REGULATION FOR PUBLIC UTILITIES 27, 28 (Michael Crew ed., 1994).

222 JORDAN JAY HILLMAN & RONALD R. BRAEUTIGAM, PRICE LEVEL REGULATION FOR DIVERSIFIED PUBLIC UTILITIES: AN ASSESSMENT 69 (1989).

223 MacDonald, Norsworthy & Fu, *supra* note 221, 38–39.

224 VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 440.

225 *Id.*

226 Bailey & Malone, *supra* note 157, at 139–41.

227 NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 13–14.

228 Schmalensee, *supra* note 218, at 434.

229 VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 440.

230 Jeffrey I. Bernstein & David E.M. Sappington, *Setting the X Factor in Price-Cap Regulation Plans*, 16 J. REG. ECON. 5, 6 (1999).

231 VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 440; *see also* LEC Price Cap Order, *supra* note 126, 6790 ¶¶ 30–32.

benefits created by price caps.[232] Determining how much should be shared is essentially a political decision. As part of the determination of how large to set the sharing dividend, regulators may be tempted to examine profits. In the process, they would destroy the independence between prices and returns that makes the incentives to economize and innovate so high-powered.[233] Unfortunately, regulatory authorities lack any way to credibly commit not to ratchet up the *X* factor in response to cost savings.[234]

The British experience under price caps is instructive. After initially setting British Telecom's *X* factor at 3% in 1984, the United Kingdom increased it to 4.5% in 1989, 6.25% in 1991, and 7.5% in 1993. This effect sharply dampens the incentive to economize on costs.[235] The experience in the United States was similar, as the *X* factor grew from 3.3% in 1990[236] to 4% in 1995[237] and 6.5% in 1997,[238] with many of those adjustments applying retroactively. The D.C. Circuit rejected these efforts as arbitrary and capricious.[239]

The empirical literature is divided on price caps' effect on rates, with most studies finding that price caps lead to modestly lower prices[240] and some studies concluding the opposite.[241] Although early studies show that price caps led to the deployment of more modern equipment,[242] other empirical studies find that price caps deter investment.[243] The empirical evidence on quality is mixed, with some studies finding no deterioration of quality,[244] others drawing the opposite conclusion,[245] and still others finding mixed results,[246] although these outcomes may have been the result of direct regulatory intervention.[247]

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232 CHURCH & WARE, *supra* note 36, § 26.2.3, at 853–54.

233 VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 441–42.

234 CHURCH & WARE, *supra* note 36, § 26.2.4, at 858; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 441–42.

235 Jamison, *supra* note 209, at 1249–50.

236 LEC Price Cap Order, *supra* note 126, 6787–88 ¶¶ 5–7, 6799 ¶ 100.

237 Price Cap Performance Review for Local Exchange Carriers, First Report and Order, 10 FCC Rcd. 8961, 9053–54 ¶ 209 (1995).

238 Price Cap Performance Review for Local Exchange Carriers, Fourth Report and Order in CC Docket No. 94-1 and Second Report and Order in CC Docket No. 96-262, 12 FCC Rcd. 16642, 16652 ¶ 18 (1997).

239 *U.S. Telecomm Ass'n v. FCC*, 188 F.3d 521, 525–26 (D.C. Cir. 1999).

240 *See, e.g.*, Robert Kaestner & Brenda Kahn, *The Effects of Regulation and Competition on the Price of AT&T Intrastate Telephone Service*, 2 J. REG. ECON. 363, 370–72 (1990); Alan D. Mathios & Robert P. Rogers, *The Impact of Alternative Forms of State Regulation of AT&T on Direct-Dial, Long-Distance Telephone Rates*, 20 RAND J. ECON. 437, 451–52 (1989). For a review of early surveys of the literature, see Sappington & Weisman, *supra* note 206, at 236–39.

241 *See, e.g.*, Christopher R. Knittel, *Regulatory Restructuring and Incumbent Price Dynamics: The Case of U.S. Local Telephone Markets*, 86 REV. ECON. & STAT. 614, 622 (2004).

242 *See* Sappington & Weisman, *supra* note 206, at 236–37.

243 *See, e.g.*, Jaison R. Abel, *The Performance of the State Telecommunications Industry Under Price-Cap Regulation: An Assessment of the Empirical Evidence* (Nat'l Regulatory Research Inst. Research Report No. 00-14, 2000), *available at* http://ipu.msu.edu/library/pdfs/nrri/Abel-State-Telecom-Price-Cap-Regulation-00-14-Sept-00.pdf.

244 *See, e.g.*, Aniruddha Bannerjee, *Does Incentive Regulation "Cause" Degradation of Retail Telephone Service Quality?*, 15 INFO. ECON. & POL'Y 243, 263–65 (2003); Donald J. Kridel, David E.M. Sappington & Dennis L. Weisman, *The Effects of Incentive Regulation in the Telecommunications Industry: A Survey*, 9 J. REG. ECON. 269, 298–300 (1996).

245 *See, e.g.*, LORENZO BROWN, MICHAEL A. EINHORN & INGO VOGELSANG, INCENTIVE REGULATION: A RESEARCH REPORT 87–88 (1989).

246 *See generally* Chunrong Ai, Salvador Martinez & David E. Sappington, *Incentive Regulation and Telecommunications Service Quality*, 26 J. REG. ECON. 263 (2004); Luis Otávio Façanha & Marcelo Resende, *Price Cap Regulation, Incentives and Quality: The Case of Brazilian Telecommunications*, 92 INT'L J. PRODUCTION ECON.

3. Regulation of Nonprice Terms and Conditions. Common carriage mandates work best when the product is a commodity[248] and when the interface between products is relatively simple, easy to monitor, and requires little information from the network.[249] Interconnection becomes considerably harder to police when the product varies in quality and the interface is complex. When that is the case, providers who are reluctant to provide service have access to a nearly endless source of nonprice ways in which they can defeat access.[250]

As a result, disputes over reasonableness are likely to spill beyond price into other aspects of the business relationship. As a result, regulators will have to oversee a wide variety of nonprice terms.[251] Indeed, the FCC's experiences in implementing TELRIC and other access regimes are far from encouraging in this regard.[252] These problems are likely to worsen as the end users, applications, technologies, and business relationships associated with the Internet become increasingly diverse.[253]

C. Enduring Structural Separation

Structural separation also represents a significant source of welfare loss. Economists have long recognized that vertical integration can lower prices, particularly when both levels are highly concentrated.[254] It can also promote productive efficiency by rationalizing production when inputs can be used in variable proportions.[255] Vertical integration can also reduce transaction costs and help protect against opportunism.[256] As noted earlier, it can also mitigate the systematic underproduction associated with positive spillovers by allowing the owner of the infrastructure to internalize a greater percentage the benefits that it creates.[257]

A recent survey of the empirical literature indicates that, aside from a few isolated studies, the weight of the evidence indicates that "under most circumstances, profit-maximizing vertical-integration decisions are efficient, not just from firms' but also from the consumers' points of view," a conclusion that the researchers did not have in mind when they began their review of the evidence and which they found somewhat surprising.[258] Moreover, the survey found "clear evidence that restrictions on vertical integration that are imposed . . . on owners of

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133 (2004); Marcelo Resende & Luis Otávio Façanha, *Price-Cap Regulation and Service-Quality in Telecommunications: An Empirical Study*, 17 INFO. ECON. & POL'Y 1 (2005).

247 Sappington & Weisman, *supra* note 206, at 248–49.

248 *See* Yoo, *supra* note 175, at 40–41.

249 *See* Gerald R. Faulhaber, *Policy-Induced Competition: The Telecommunications Experiments*, 15 INFO. ECON. & POL'Y 73, 76–86 (2003).

250 *Verizon Commc'ns Inc. v. Law Offices of Curtis V. Trinko, L.L.P.*, 540 U.S. 398, 414 (2004); *AT&T Corp. v. Iowa Utils. Bd.*, 525 U.S. 366, 394–96 (1999) (Breyer, J., concurring in part and dissenting in part).

251 Yoo, *supra* note 35, at 1896–97.

252 *See* Yoo, *supra* note 175, at 40–42.

253 *See id.* at 40.

254 *See, e.g.*, Joseph J. Spengler, *Vertical Integration and Antitrust Policy*, 58 J. POL. ECON. 347, 352 (1950).

255 *See, e.g.*, John M. Vernon & Daniel A. Graham, *Profitability of Monopolization by Vertical Integration*, 79 J. POL. ECON. 924, 924–25 (1971).

256 *See, e.g.*, OLIVER E. WILLIAMSON, MARKETS AND HIERARCHIES: ANALYSIS AND ANTITRUST IMPLICATIONS 104, 124 (1975) (arguing that vertical integration economizes on transactions and suppresses opportunistic profit haggling).

257 *See* Yoo, *supra* note 132, at 193

258 Francine Lafontaine & Margaret Slade, *Vertical Integration and Firm Boundaries: The Evidence*, 45 J. ECON. LIT. 629, 680 (2007).

retail networks are usually detrimental to consumers."[259] They thus called on "government agencies to reconsider the validity of such restrictions."[260]

The FCC's prior experience with structural separation has not been sanguine. For example, the line-of-business restrictions imposed by the breakup of AT&T forced the court to consider hundreds of waiver requests.[261] These requests could take over four years to process and were estimated to cost over one billion dollars.[262]

The experience under the structural separation mandated by the *Computer Inquiries* was similar. The separate subsidiary requirements prevented phone companies from offering caller ID and other services. One econometric study estimated the welfare losses from the delayed introduction of these services exceeded one billion dollars each year.[263] These costs led the FCC to abolish the structural separation requirement in favor of an accounting separation requirement.[264]

The general theory and empirical evidence as well as the FCC's experience all suggest that the structural separation imposes significant harms. That fact counsels extreme caution before embracing a regulatory regime that would mandate it.

D. Facilitating Collusion

Another drawback is that common carriage regulation has long been recognized to facilitate collusion.[265]

1. Barriers to Entry. As an initial matter, common carriage typically imposes access controls. As noted earlier, federal law requires interstate carriers to obtain a certificate of public convenience and necessity before constructing or extending any new facilities. At best, the clearance process delays entry.[266] At worst, it can block entry altogether, as evidenced by Congress's enactment of a provision prohibiting states from using the certificate process from forestalling the emergence of competition.[267]

In addition, firms may use common carriage regulation as an entry barrier. It has long been recognized that industry-wide regulation can benefit incumbents despite the additional costs of compliance if new entrants and fringe players will find it harder to bear the regulatory

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259 *Id.*

260 *Id.*

261 SPULBER & YOO, *supra* note 76, at 330.

262 *See* Paul H. Rubin & Hashem Dezhbakhsh, *Costs of Delay and Rent-Seeking Under the Modification of Final Judgment*, 16 MANAGERIAL & DECISION ECON. 385, 385–88, 397 (1995).

263 Jerry A. Hausman, *Valuing the Effect of Regulation on New Services in Telecommunications*, *in* 1997 BROOKINGS PAPERS ECON. ACTIVITY: MICROECONOMICS 1, 14–15.

264 Amendment of Sections 64.702 of Commission's Rules & Regulations (Third Computer Inquiry), Report and Order, 104 F.C.C.2d 958, 1002–11 ¶¶ 79–97 (1986), *aff'd and modified by* 2 FCC Rcd. 3035, 3037 ¶ 10 (1987), *vacated and remanded sub nom.* California v FCC, 905 F.2d 1217, 1238–39 (9th Cir 1990).

265 *See, e.g.*, Andrew F. Daughety & Robert Forsythe, *The Effects of Industry-Wide Price Regulation on Industrial Organization*, 3 J.L. ECON. & ORG. 397, 428–29 (1987).

266 *See* Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor, Further Notice of Proposed Rulemaking, 84 F.C.C.2d 445, 455 ¶ 30 (1981) [hereinafter Competitive Carrier Further NPRM].

267 *See* 47 U.S.C. § 253(a) (2012).

burden.[268] Indeed, there are examples where firms have actively sought regulation in order to create entry barriers.[269]

2. Standardization of Products and Pricing. Cartels are much easier to form and enforce when products are homogeneous. When products are uniform, any coordination designed to reduce competition need only focus on a single dimension: price.[270] When products are heterogeneous, however, any price agreement must take into account all of the ways that products can vary. This makes agreements both harder to reach and to police.[271] Indeed, if products are so customized that each is individualized, cartel cheating may be almost impossible to detect or prevent.[272] Another practice that tends to undermine oligopoly discipline is unsystematic price discrimination.[273] Indeed, secret price discrimination is one of the best ways for cartel members to cheat.[274] Cartels also function best when demand is more or less constant, which in turn helps ensure that prices remain stable.[275]

Common carriage has the effect of facilitating collusion along each of these dimensions. In short, standardizing both products and prices makes cartel agreements easier to reach and any defection from the cartel cheating easier to identify.[276] Moreover, by preventing competitors from deviating pricing either up or down, common carriage can use the government to serve as an effective cartel enforcer. At the same time, entry restrictions and the ratemaking process can help stabilize demand.

3. Pooling of Information and Advance Notice of Product Changes. Common carriage has the effect of making all pricing information visible and easily available to all other industry participants. In addition, it requires every provider to announce to all of its competitors any planned changes in prices or product offerings long in advance. The loss of lead time dampens the incentive to make price cuts.[277]

Pooling of pricing information has long been recognized as a facilitating practice that makes it easier to form and maintain a cartel.[278] As the FCC recognized:

Tariff posting also provides an excellent mechanism for inducing noncompetitive pricing. Since all price reductions are public, they can be quickly matched by competitors. This reduces the incentive to engage in price cutting. In these circumstances firms may be able to charge prices higher than could be sustained in an unregulated market. Thus, regulated competition all too often becomes cartel management.[279]

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268 Herbert Hovenkamp, *Antitrust Policy After Chicago*, 84 MICH. L. REV. 213, 276–77 (1985).

269 For a survey of this literature, see Robert E. McCormick, *The Strategic Use of Regulation: A Review of the Literature*, *in* THE POLITICAL ECONOMY OF REGULATION: PRIVATE INTERESTS IN THE REGULATORY PROCESS 13, 18–25 (Robert A. Rogovsky & Bruce Yandle eds., 1984).

270 SCHERER & ROSS, *supra* note 32, at 279.

271 135; SCHERER & ROSS, *supra* note 32, at 279.

272 *See* SCHERER & ROSS, *supra* note 32, at 279–80.

273 HOVENKAMP, *supra* note 33, § 14.5b, at 578; SCHERER & ROSS, *supra* note 32, at 500; VISCUSI, HARRINGTON & VERNON, *supra* note 44, at 349–50.

274 HOVENKAMP, *supra* note 33, § 4.1a2, at 150–51.

275 CARLTON & PERLOFF, *supra* note 135, at 137.

276 HOVENKAMP, *supra* note 33, § 4.1a3, at 151–52.

277 Scott M. Schoenwald, *Regulating Competition in the Interexchange Telecommunications Market: The Dominant/Nondominant Carrier Approach and the Evolution of Forbearance*, 49 FED. COMM. L.J. 367, 415–16 (1997).

278 HOVENKAMP, *supra* note 33, § 5.3, at 215–17.

279 Competitive Carrier Further NPRM, *supra* note 266, 454 ¶ 26.

Such information is particularly helpful to cartels if that information pertains to changes in product or changes to price.[280]

4. Ability to Use the Government to Enforce Cartel Pricing. Finally, cartels need some means to enforce the cartel by preventing price cutting. Cartels often find them difficult to enforce, as any mechanism must not reveal to the government they are colluding.

Common carriage provides for an open and legal way to enforce prices. By requiring that prices conform exactly to the published rate, common carriage prohibits any deviations from the established price. Under the filed rate doctrine, regulated entities cannot cut their prices. Moreover, to the extent that these are enshrined in regulation, any compliance with these prices is immune from antitrust scrutiny.[281]

In addition, common carriage gives any member of the public the right to challenge any proposed change to a tariff.[282] Firms have routinely used this authority to oppose price reductions proposed by their competitors.[283] As such, tariffing creates the same opportunity for interference as competitor suits in antitrust law, where a less efficient competitor can try to prevent its rival from competing on the merits.

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The imposition of common carriage thus facilitates collusion in a wide variety of ways. The danger of expediting the formation and maintenance of a cartel provides another important reason to resist common carriage.

E. The Displacement of Business Judgment

A final criticism is that rate-of-return regulation necessarily means "substituting the judgments of lawyers for those of business persons and engineers."[284] This inevitably means that decisions will be made in no small part on political considerations.[285] Decisions about production, investment, and pricing are more properly made by people with industry-specific expertise and who are ultimately accountable to their shareholders for the performance of their business.

IV. CLASSIFYING BROADBAND INTERNET ACCESS SERVICE AS A TELECOMMUNICATIONS SERVICE RAISES DIFFICULT PROBLEMS WITH PRIVACY

Classifying broadband Internet access service as a telecommunications service raises difficult definitional problems with respect to privacy. Prior to the 2015 Open Internet Order, the Federal Trade Commission (FTC) served as the privacy regulator for all aspects of the Internet industry. However, the common carrier exception in the Federal Trade Commission Act meant that the 2015 Order foreclosed the FTC over jurisdiction over broadband Internet access providers.

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280 CARLTON & PERLOFF, *supra* note 135, at 138; HOVENKAMP, *supra* note 33, § 4.1, at 147.

281 *See Parker v. Brown*, 317 U.S. 341, 368 (1943).

282 47 U.S.C. § 204(a)(1) (2012). *See generally* Schoenwald, *supra* note 277, at 411–12.

283 *See* Haring & Kwerel, *supra* note 126, at 10.

284 CRANDALL & WAVERMAN, *supra* note 98, at 99 (quoting William J. Baumol, *Reasonable Rules for Rate Regulation: Plausible Policies for an Imperfect World*, *in* PRICES: ISSUES IN THEORY, PRACTICE AND PUBLIC POLICY 108, 108–23 (Almarin Phillips & Oliver E. Williamson eds., 1968)).

285 CRANDALL & WAVERMAN, *supra* note 98, at 99–100; NAT'L TELECOMMS. & INFO. ADMIN., *supra* note 97, at 14–15.

At the same time, the judicial decisions on ancillary jurisdiction hold that although the Communications Act of 1934 gives the FCC authority over "all interstate and foreign communication by wire or radio" and related matters that have incidental and minimal effects on that communication, at some point after the traffic arrives, the effect on communications becomes too remote to fall within the FCC's authority.[286] The result is that some privacy-related issues would fall within the FCC's authority, while others fall within the FTC's authority.

This forces Internet companies to determine which agency has jurisdiction over various types of practices. Because the FCC's and the FTC's rules apply similar, but slightly different, requirements, Internet companies must carefully parse both sets of rules and determine what is required of them. These definitional questions become increasingly difficult and increasingly important in a world in which Internet companies are becoming providing ever-more innovative bundles of services.

Consider Google Fiber, which offers both a broadband Internet access service along with complementary services, including access to content and tablets to serve as program guides. Google Fiber would have to scrutinize its system and determine the exact point where its operations transition from FCC jurisdiction to FTC jurisdiction. It must then discern the exact requirements of each regime and apply those requirements to each aspect of its operations. Google Fiber is simply one example of the way that the historical divisions among types of firms are starting to break down. Verizon's acquisitions of Yahoo!, America Online, and a number of providers of smart city technologies exemplify the emerging changes that are transforming the industry, as does AT&T's proposed acquisition of Time Warner.

These new forms of industrial organization promise to offer new benefits to consumers who care only about the provision of innovative services and not the extent to which those new services fit with historical regulatory divisions. The definitional problems become more acute once one recognizes that technologies can be modified to shift responsibility for particular functions from one part of the architecture to another. The danger is that decisions about how to allocate functionality will be determined by regulatory requirements instead of by what would best serve consumers.

V. CIRCUMSTANCES HAVE CHANGED SINCE ADOPTION OF THE 2015 OPEN INTERNET ORDER

Another problem with the FCC's past approach to net neutrality that has gone largely unrecognized is the extent to which it has been fundamentally backward looking and conservative. Both the 2010 and 2015 Open Internet Orders asserted that the Internet's past success was the product of certain architectural commitments and that those commitments must be preserved if those successes were to be continued into the future. The problem with this argument is well underscored by the standard warning given to all investors that past performance does not necessarily predict future results. All things being equal, past practices should lead to similar results. But if circumstances have changed, there is no reason to believe that maintaining commitments to past principles continue to be necessary for success.

The basic architectural commitments cited by the FCC emerged by the mid-1990s, when the Internet first emerged as a mass market phenomenon.[287] At that time, the Internet industry

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[286]. *American Library Ass'n v. FCC*, 406 F.3d 689, 700, 707 (D.C. Cir. 2005); *Motion Picture Ass'n of America v. FCC*, 309 F.3d 796, 803–07 (D.C. Cir. 2002); *Ill. Citizens Comm. for Broad. v. FCC*, 467 F.2d 1397, 1400 (7th Cir. 1972).

[287] The discussion that follows draws on YOO, *supra* note 39.

was fairly uniform in terms of users, transmission and device technologies, and applications. In short, the Internet was dominated by academics using a personal computer connected to a telephone line to send email and browse the web.

Since that time, the Internet ecosystem has become much more diverse. The number and heterogeneity of users has exploded. Users increasingly connect to the network through smart phones and tablets connected to wireless networks. And modern applications, including streaming video and video chat, have become much more demanding.

The natural response is for the networking services provided to meet these demands is to become more diverse in response. By requiring that all traffic employ a single, uniform class of service, net neutrality threatens to impose a form of *net uniformity* that does not respond to modern demands. Consumers and innovation would be better served by permitting the Internet to follow a practice of *net diversity* that is more responsive to these ever changing needs.

The advent of 5G and the Internet of Things (IoT) threatens to make these problems even more acute. As an initial matter, IoT applications are requiring a higher level of reliability than supported by the current best-efforts architecture. They also often require latency guarantees that the current architecture cannot provide.

Similarly, 5G offers the promise of software defined networking and network function virtualization, in which network services are no longer provided by integrated companies, but rather by independent companies that allow customers to lease resources temporarily on a transactional, temporary, set-up and take-down basis. This practice is often described in the 5G context as network slicing.[288] The problem is that network slicing is widely perceived as being inconsistent with net neutrality.[289] In particular, paragraph 209 of the 2015 Open Internet Order provides that anon-BIAS data service (previously known as specialized service) are "not a generic platform—but rather a specific 'application level' service." If allowed to stand, this language may prevent companies from offering network slicing as a genarl service.

CONCLUSION

I will close by offering a few observations about what net neutrality rules will not solve.

First, it will not cause prices of broadband Internet access services to decline. Broadband Internet access service prices are determined by the number of competitive alternatives in last-mile services. Vertically disintegrating the Internet industry will not have any effect on this number in either direction.

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[288] Konstantinos Samdanis, *From Network Sharing to Multi-Tenancy: The 5G Network Slice Broker*, IEEE COMMC'NS, July 2016, at 32, https://arxiv.org/pdf/1605.01201.pdf; Tarik Taleb et al., *"Anything as a Service" for 5G Mobile Systems*, IEEE NETWORK, Nov./Dec. 2016, at 84, http://www.mosaic-lab.org/uploads/papers/674df78c-9ab1-4705-8084-9a21c7afb469.pdf; Carl Weinscheink, *Network Slicing a Key to 5G*, IT BUS. EDGE (Jan. 11, 2017), http://www.itbusinessedge.com/blogs/data-and-telecom/network-slicing-a-key-to-5g.html.

[289] *FCC Chief Says Net Neutrality Rollback Will Hasten 5G Infrastructure Buildout*, YAHOO! FINANCE (Feb. 28, 2017), https://finance.yahoo.com/news/fcc-chief-says-net-neutrality-212428898.html; Zoraida Frias & Jorge Pérez Martínez, *5G Networks: Will Technology and Policy Collide?*, TELECOMM. POL'Y (forthcoming 2017), http://www.sciencedirect.com/science/article/pii/S0308596117302239; Stephen Lawson, *5G, Net Neutrality May Be on a Collison Course*, COMPUTER WORLD (Mar. 4, 2015, 10:24 AM PT), https://www.computerworld.com/article/2892421/5g-net-neutrality-may-be-on-a-collision-course.html; Iain Morris, *5G Calls for a EU Rethink on Net Neutrality*, LIGHT READING (July 7, 2016), http://www.lightreading.com/mobile/5g/5g-calls-for-eu-rethink-on-net-neutrality/a/d-id/724600; John C. Tanner, *The 5G, IoT, and Net Neutrality Trifecta*, TELECOM RAMBLINGS (Mar. 16, 2015), http://www.telecomramblings.com/2015/03/the-5g-iot-and-net-neutrality-trifecta/.

Second, paying for prioritized service is often erroneously described as requiring consumers to pay twice. The reality is that all value in the end comes from consumers. It is simply a matter of how the payment is structured. Consider the Comcast-Netflix dispute that figured prominently in the consideration of the 2015 Open Internet Order. If paid prioritized services are not permitted, all costs of increasing network capacity will be included into the subscription fees charged by Comcast. If paid prioritization is permitted and Netflix makes a side payment to Comcast, the result should be a slightly lower monthly payment to Comcast and a slightly higher monthly payment to Netflix. It is not clear that how the payment is structured is a matter of policy concern. If anything, the latter is fairer because it forces those responsible for the increase in demand that requires the upgrade in network capacity to pay for the upgrade.

I hope that these comments will help the Commission in its consideration of his rulemaking proceeding. I would be happy to provide the Commission with any other assistance that it would find helpful.